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Something About Bell Making

Interesting Information About the History and Peculiarities of Bells

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WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

ONE of the most interesting industries, surely one of the oldest, and apparently one of the least understood by the public is that of bellmaking, about which so much has appeared in the religious and secular press of late. "What are bells made of?" "What is a peal, a chime, a carillon?" "How are bells tuned and selected for tone color?" "What is the right number for a church?" "How are they rung?" "Do bells get out of tune?" "Where are the best bells made?" These are some of the "daily dozen" questions put to bell-founders.

The New Liberty Bell.

It is impossible to trace bells to their origin: they were commonly known in the earliest ages, and are thus referred to by the most ancient writers. Doubtless bells, so-called, were at first little more than concave pieces of metal, the natural sounds of which suggested their use for certain purposes, and in this form their origin may quite possibly be said to date from the discovery of the sonorous qualities of metals. As to the antiquity of bells, an old painting of King David represents him as playing with a hammer upon a number of bells hung up before him, while one old writer gravely asserts that Tubal Cain, "the instructor of every artificer in brass and iron," formed the sounding metal into a kind of rude bell, and that Noah employed a simular instrument to summon his ship carpenters to their work. The thorough knowledge possessed by the ancients in the working of metals renders such statements not altogether absurd.

It is generally understood that large bells, or those of expanded form, were first made by the Christians, but they were undoubtedly used in China, in religious worship, at least two thousand years before the Christian era. It is not fully known who first introduced bells into Christian churches. Many writers claim that Paulinus, Bishop of Campania, in Nola, Italy, first used them, A. D. 400, but he makes no mention of bells in a detailed account of his churches. Others assert that church bells were first used by Pope Sabinianus, about the year 600, to distinguish the canonical hours, but we read of bells being in use by the Bishop of Landaff, in his churches, in the year 550. Certain it is that Christian architecture and the introduction of turret, or church bells, were nearly contemporaneous events, and that it was solely for the support of bells that church towers were first erected. Indeed, from an early time, bells were regarded as a necessary adjunct to every church edifice, as is quite commonly believed at the present day.

A bell of special interest in this country is the famous Liberty Bell. This bell was cast for the State House in Philadelphia in the year 1753, and upon it, though made twenty-three years before the Continental Congress met in the State House, were placed the words of the Bible: "Proclaim Liberty throughout all the land unto all the inhabitants thereof." It was

The "Cambridge Quarters"

under this bell that the representatives of the thirteen colonies first "proclaimed liberty," and this bell, with its iron tongue, started the tidings throughout the land. The bell subsequently broke when ringing a fire alarm. In the centennial year, 1876, a bell weighing thirteen thousand pounds, to represent the thirteen original States, was made by my company and set in the tower of the old State House, above Independence Hall, just where the old bell was formerly suspended, and it bears the same inscription. This fine bell is in constant use, sounding with its deep tones the hours of the day.

Bells are designed according to mathematical laws. The shape differs in various countries. Chinese bells are frequently square, Japanese and Korean bells barrel-shaped, Italian bells have an unusually long "waist" or middle section. The ideal bell composition is made of two metals only, copper and tin. Clearness of tone and strength of casting are derived from a proportion of seventy-eight parts of new copper to twenty-two parts of block tin. It is a delusion that sweet-toned bells have silver in them. The more silver there is in the composition the worse the result, as a matter of fact.

Big Bell for Metropolitan Tower.

A bell's tone is affected not only by its metallic composition, but by its proportions. The "voice" of a bell is really a chorus of voices. The tone is many tones blended. The better the bell, the better it sounds at a distance and, on the other hand, a bell may give off a good tone when heard at very close range, and yet have a very bad tone indeed when heard farther away. The vibrations of bell tones are mysterious to the unlearned, but skilled founders work with mathematical precision. While the tones of bells never change, faulty adjustments may cause a set to sound out of tune, but this is easily corrected.

A peal, in this country, is generally said to contain three bells, attuned to the first, third and fifth tones of the musical scale. These bells are usually furnished with full swinging mountings. The Westminster peal or "Cambridge quarters," comprising four bells, is also very popular. A simple way of musically describing this combination is to say that it consists of the first, fourth, fifth and six notes of the major scale, the "fourth" being the keynote. The range is such that numerous pleasing changes, but no tunes can be produced. The bells are operated by one person from another floor in the belfry, and sometimes tower clocks are installed to play them automatically.

How Chimes Are Placed.

The Metropolitan Tower has a fine Westminster peal, placed 650 feet above the sidewalk, these being the world's highest bells. Voyagers at sea, beyond Sandy Hook, have reported hearing those bells at that distance; and yet so soft are the tones, they are listened to with pleasure by visitors to the observatory gallery, one story below their location. To witness and hear, at close range, the chiming of the quarter-hours is one of the features of "seeing New York." Other peals of large bells in the Roanoke Building, Chicago; and in the Straus Building, Chicago, and in the new structure of the Consolidated Gas Building on the site of the old Academy of Music in this city, are in the order named, the second, third and fourth highest sets of bells above the ground in the world. My company enjoys the distinction of having cast those four highest sets of bells.

In an address delivered shortly before his death, the late Bishop Greer said in part: "Whenever I hear the chimes ring out from the Metropolitan Tower in the midst of all the snares, the perils and the temptations of this great Metropolitan City, I think of the old quaint verse to which those chimes were originally set:

"O Lord our God,
Be Thou our Guide,
That by Thy help
No foot may slide."

American bell founders apply the word "chime" to a set of bells upon which tunes may be played, the minimum number being eight bells attuned to the eight notes of the octave, or diatonic scale. There is no limit to the number of bells necessary to constitute a chime, except that which is suggested by the constant decrease of weight and the consequent shrillness of tone. Experience has demonstrated to the satisfaction of many who are qualified

Chimes for Grace Church, New York City.

to judge that a set of twenty bells, chromatically attuned, is about the limit to secure satisfactory results, for bells have their limitations, and large and small bells never sound homogeneous when rung together. For those reasons, coupled with the trouble and expense of obtaining competent ringers, sets containing from thirty to fifty bells, some weighing as little as eight or ten pounds, such as are used principally in Belgium and Holland, have not gained much popularity elsewhere, particularly in this country where a few sets of European manufacture have been installed within the last sixty years. Such chimes are played in the manner that a xylophonist performs on his instrument, usually on the small bells with the occasional sounding of a large one, the operation being performed manually from hand levers. It is a violent form of exercise. Tunes so played are often difficult to recognize, and the American public prefers to hear the old familiar church hymns and patriotic airs, played either in single or double notes.

American ingenuity has served to provide a way of playing chimes electrically from a small console having keys like those of an organ, and many of the worshippers who arrive early for the services at Grace Church, Broadway and 10th Street, watch with interest the ease with which Miss Mary Gillies sounds the big bells from her tiny keyboard.

"Carillon" is the French word for chime. As you will see by referring to your dictionaries, the two words have precisely the same meaning. There is no more difference between "carillon" and "chime" than between "chapeau" and "hat," or "modiste" and "dressmaker."

Most of the chimes produced in this country have ten bells, a sufficient number for the playing of hundreds of hymns, and yet not too large for the average ringer to operate acceptably. The well-known chime in Trinity Church, New York, has ten bells.

For special reasons chimes of more than ten bells are occasionally ordered, and my company recently installed a fine chime of fifteen bells in the new George F. Baker Library at Dartmouth College. Our chime in Grace Church, New York, has twenty bells.

It should be a source of satisfaction to all Americans to know that the world's best attuned bells are made in their own country. Archer Gibson, famous organist and composer, says: "America leads the world today in the manufacture of the highest grade musical instruments. Today the greatest pianist of the world plays an American-made piano, the greatest harpist plays an American-made harp, the greatest flutist plays an American-made flute, the greatest organist plays an American-made organ, the greatest chimer plays an American-made chime, and so on ad infinitum."

While some European founders say that the harmonics of a bell can be controlled by the use of instruments that will scrape away its inner surface, bells so treated fail to bear out this assertion. This is merely an economical way of treating bells that should have been cast right at first.

The real art in the production lies in making the patterns, and so carefully is this done by the most expert designers that the lines are drawn with the blade of a knife, the mark of a pencil being sufficiently coarse materially to change the weight of the finished bell. It is not to be supposed that the exact pitch will always result from this method, but in assembling a chime from bells so made, even though ten times the requisite number of bells are cast to choose from, the result in attunement and tone color will compensate for the time and expense involved. The makers of high-class bells are as particular as gem experts matching a necklace, and by far the best sets of bells found anywhere are those that required the least alteration after being assembled.

Casting Zinc Slabs

Q.—We are producing zinc plates 12 by 24 by 1½ inches in size, which are used ultimately for printing processes. The zinc is cast in open iron molds and later rolled. The method is as follows:

Melting is done in four No. 125 crucibles in stationary furnaces fired with oil. The metal is poured at about 850° F. and when it hits the air, there seems to be some shrinkage in the center of the slab usually, but sometimes at the edges also. This seems to cause defects in the form of small holes in the plates and when the metal gets under the rolls they are found to be useless for the printing process in which they are to be used.

It is impossible to use a closed mold because the fumes of the molten metal must be allowed to escape, and we cannot use iron pots for melting as we do not want to run the chance of getting iron into the metal. With two men our equipment can turn out about 8,000 pounds a day.

We are not sure that the shrinkage causes the defects, although that is the opinion of some who have tried to solve the problem. Perhaps the metal can be poured at a little higher temperature, say 900° F. We do not use any flux and only pole the metal. The zinc we use is supposed to contain about one-half per cent of cadmium and lead; no other impurities. It is all virgin metal and the two impurities, we believe, can do no harm. However, if there were another foreign matter in the metal, it might cause the defects. What do you think? Is a flux needed in this metal, in your estimation? Do you think that different equipment would do any good? We have thought about a tilting crucible furnace and two men to pour the metal with shank and smaller crucible, say a No. 70. We have a movable round table that could be used for pouring directly from the melting pot into the open molds. However, the metal is, in our opinion, the main thing to consider. We want to get the top of the plate as smooth as possible; as smooth as the bottom, if such a thing can be done. Can you tell us anything about aluminum pots for melting zinc? Have such pots been found successful? Please give us some advice on this subject.

A.—Your method of melting and pouring the zinc slabs for rolling is universal practice. Iron is the chief element to guard against. If the metal contains less than .075 lead and is free from iron, you should not have any trouble with shrinkage. The reason zinc is poured in open molds is that the zinc increases 11 per cent in volume when passing from the solid to the molten state. On cooling it contracts very little and is therefore very well adapted to casting in open molds. Zinc melts at 760° F. and boils at 1,652° F.; around 850° F. would therefore seem to be the proper pouring temperature. We cannot find anything wrong with your practice in melting.

It appears then that the shrinkage must be due to impurity of metal, or to your method of pouring. You should pour the slabs with the molds as close to the pot as possible, and pouring should be done as steadily as possible. Your idea about the movable table is very well, but that alone will not overcome the difficulty. On the whole, we believe that impurity of metal is most probably your trouble. Look for iron in it. —W. J. Reardon.

Standardizing Ingot Metal Purchases

Minutes of Organization Meeting of the Special Committee of American Society for Testing Materials on the Promotion of General Use of Specifications for Copper Alloys in Ingot Form, Held at Cleveland Athletic Club, Cleveland, Ohio, November 26, 1928

IN our December issue, page 510, we published a preliminary report of the first meeting of the above committee. Below is a complete report of the proceedings.

The meeting was called to order at Cleveland Athletic Club, November 26, 1928, at 10.45 a. m. by G. H. Clamer, President, The Ajax Metal Company, with the following in attendance:

D. M. Avey, Editor, "Foundry," Penton Publishing Co., Cleveland, O.

Adolph Bregman, Managing Editor, THE METAL INDUSTRY, New York City.

L. B. Case, Society of Automotive Engineers, General Motors Corp., Detroit, Mich.

G. H. Clamer (chairman), Ajax Metal Company, Philadelphia, Pa.

W. S. Doxsey, Editor, "Daily Metal Trade," Penton Publishing Co., Cleveland, O., accompanied by Mr. Rooney.

W. B. Price, Scovill Mfg. Company, Waterbury, Conn. (also representing War Dept.).

William Romanoff, H. Kramer and Company, Chicago, Ill.

S. P. Trench, Vice President, "American Metal Market," New York City.

C. L. Warwick, Secretary-Treasurer, American Society for Testing Materials, Philadelphia, Pa.

F. L. Wolf, Ohio Brass Company, Mansfield, O.

Mr. Clamer was elected chairman of the committee. Mr. Warwick was elected as secretary.

The Secretary outlined the discussions within the Society that finally had resulted in the decision of the Executive Committee of the Society to form a special committee comprising producers, consumers and representatives of technical and trade journals

> "to study and promote the use of specifications covering copper alloys in ingot form as the basis of price quotations in the technical and trade journals, with authority to recommend to the appropriate standing committee of the Society such revision in the A.S.T.M. specifications affected as its studies may indicate to be desirable."

It was emphasized that the Special Committee is not a "specification writing" committee, but that at the same time its studies would very probably indicate the desirability of unifying existing specifications and it has authority from the Executive Committee to study existing specifications in furthering the purposes for which it is organized.

The chairman called attention to the recent organization of the Non-Ferrous Ingot Metal Institute, which represents approximately 90 per cent of the production of copper alloy ingot metal (approximately 150,000,000 lbs. annually). The Institute is officially represented on the Special Committee.

There then followed a general discussion of the whole subject, in which the following points were brought out as representing the general consensus of the members present:

(a) That the support of the Non-Ferrous Ingot Metal Institute representing the producing industry, was essential to the ultimate success of the movement to agree on definite standards for ingot metals and to base market quotations thereon.

(b) That price quotations in the trade papers, based on definite standards, would be advantageous to all parties at interest, i.e., producers, consumers and trade papers.

The representatives of the trade papers explained that their market quotations are based on information supplied principally by producers without definite mention of quality standards, and that frequently the differences in prices for the same commodity undoubtedly reflected differences in quality. Occasionally prices are checked by consulting the consumers.

(c) That the maximum usefulness would result if definite standards were universally agreed to and could be designated as American Standards by the American Standards Association. In this connection Mr. Warwick stated it would be the policy of the A.S.T.M. to offer its specifications to the A.S.A. when they are so revised as to be acceptable to all parties at interest, as expressed thru formal acceptance of the several interested associations and societies.

(d) That a considerable proportion (stated approximately from two-thirds to three-fourths) of the production of copper alloy ingots is furnished to specifications; but that there is wide diversity among the various specifications.

(e) That education among both producers and consumers is necessary, in order that minor differences between the many specifications of the consumers may be adjusted without detriment to the quality of the products and the full economic benefits of reducing the number of alloys realized.

(f) That vigorous support of the producing interests of definite specifications, mutually acceptable to producer and consumer, would go far to "sell" the use of standards throughout the industry, and that the trade papers and technical journals could greatly assist the movement by giving publicity to the present and subsequent discussions.

Following this general discussion, the following actions were taken by the committee through motions duly offered, seconded and unanimously carried:

Voted, that the Secretary send copy of the minutes of this meeting to the Non-Ferrous Ingot Metal Institute and request their cooperation in the work of the Special Committee.

Voted, that the Special Committee, as a necessary preliminary step in its work, prepare (preferably in tabular form) a comparative abstract of the requirements of the available specifications for copper alloys in ingot form, including those of producers, consumers, technical societies, trade associations, etc., and that the cooperation of the Non-Ferrous Ingot Metal Institute be requested in securing specifications of producers and of consumers, with a statement of the relative amounts of the alloys furnished to various specifications and with mention of the uses, where known, of the alloys furnished.

Voted, that the chairman be authorized to appoint, if necessary, a committee to review and study the abstract of specifications.

Note.—It was **agreed** that the Chairman and Secretary would initiate the compilation of the desired abstract.

Voted, that the Secretary send copy of the minutes with a suitable explanatory communication to the selected list of producers and consumers for their information, with a request for comment upon the work being inaugurated by the Special Committee.

Note.—It was **agreed** that the representatives of the

trade papers on the Special Committee would furnish lists of producers and consumers to the Secretary for this purpose.

The committee having discussed certain questions of personnel of its membership, it was on motion

Voted, that in view of the survey of existing specifications about to be undertaken and the probable influence of this survey in revising existing specifications of the Society, N. K. B. Patch, of the Lumen Bearing Company, chairman of the sub-committee of A.S.T.M. Committee B-5 in charge of specifications for cast copper alloys, be invited to membership on the Special Committee.

Voted, that a further invitation be extended to the Federated Metals Corporation to become a member of the Special Committee.

It was agreed that copies of the minutes of the Special Committee should be sent to the Secretary of the Non-Ferrous Ingot Metal Institute.

Mr. Doxsey suggested the possibility of putting the production of ingot metal upon a "certified" basis, in the way that the malleable iron castings industry, through the association of the industry (now the Malleable Iron Research Institute, Inc.), has promoted the production by its members of "Certified Malleable Castings," certified to meet a definite standard (corresponding to A.S.T.M. Specifications for Malleable Castings, A 47-27). The certification in this case is based upon tests of the product of the members of the Institute made by an independent laboratory. The discussion of this suggestion brought out the view that such certification, based upon definite standards and unbiased tests of the ingot metal, was distinctly worthy of consideration by the producing industry. The Chairman stated he was certain it was the desire of the industry as organized in the Non-Ferrous Ingot Metal Institute to place the production of ingot metal upon the highest practicable standard of quality consistent with requirements. It being obvious that such a certification plan could be inaugurated only by the producers themselves, it was on motion

Voted, that the Special Committee suggest to the Non-Ferrous Ingot Metal Institute that they give consideration to the possibilities of such a plan of "Certification."

Mr. Bregman asked to what extent the trade papers would be at liberty to give publicity to this meeting. It was **agreed,** that a general news account of the meeting be authorized immediately for publication in the trade papers, and that further detail accounts of the meeting, together with editorial comment, be based upon the official minutes of the meeting.

Mr. Avey raised a question as to the official title of the committee, pointing out that scope evidently intended by the Executive Committee of the Society was broader than merely price quotations and that the work here outlined for the committee distinctly emphasized promotion of use of specifications. After some consideration, it was **agreed** to designate the committee as follows:

"Special Committee on Promotion of General Use of Specifications for Copper Alloys in Ingot Form."

It was **agreed** that there were no further steps the Special Committee could take at this time, and that the survey of existing specifications should be undertaken as expeditiously as possible.

Silver Brazing and Soldering in Airplane Construction

By R. R. SHUMAN

AN interesting example of the degree to which airplane manufacturers subordinate everything to the safety factor, is the manner in which they use silver solders in brazing parts of their ships or motors that are subject to vibration or are likely to encounter relatively high operating temperatures.

Inquiry on this subject at the recent International Aeronautical Exposition at Chicago developed some interesting facts.

For instance, the Siemens and Halske attendant showed how that great German firm used silver solder in its airplane motors. Push rods, steel bushings on the steering bridge, as well as all copper pipe connections on both fuel and oil lines were brazed with silver. This material was employed because of its resistance to shock and vibration, as well as because it withstands relatively high operating temperatures.

The Wright Aeronautical Company attendant showed how silver solder was used in brazing external oil lines and push rod bushings on airplane motors. He stated also that the joints on the water pipes of the Wright Marine Engines were silver welded. From another source it was learned that silver solder is used in attaching flanges at several places in the Wright airplane motor; also for soldering the thermocouples.

Charles H. Day, vice-president of the Gates-Day Air-Craft Corporation, Paterson, N. J., and a veteran airplane designer, said: "Gasoline and oil lines on airplanes are subjected to tremendous vibration. For this reason silver solder should always be used in the brass couplings of the copper fuel and oil lines. Silver seems to be the only welding material that will be proof against such vibration."

In some makes of motors silver is used in joining feed lines to the carburetor. Some employ it in connections of control wires and cables needing strong joints.

N. V. Clements of the Garden City plant of the Curtiss Aeroplane and Motor Company replied to a written inquiry, to the effect that their main use of silver solder is soldering brass connections and fittings to copper fuel and oil pipes.

My attention was called to U. S. Army specifications. Bulletin 57-97 A, of April 15, 1926, which, together with form 57-O, makes the use of silver solders mandatory for certain applications in the construction of army planes, notably for joining all copper tubing.

Only a few people were interviewed because it soon became evident that "silver-welding" in some form was standard practice in the industry, though its application differed with the design of the ships or their motors.

Silver solders fuse at from 1600° F. down to 1325° F. according to their silver content; the higher the silver the lower the fusing point.

In addition to their strength, toughness and resistance to relatively high operating temperatures they are described as having even a higher electrical conductivity than copper; explaining their use in securing resistance wire to terminals and leads, in radio resistors, or in all other places where it is important that resistance be kept at a certain value.

My information is that commercial silver solders have recently been standardized to a dozen definite formulas; the richest mixture has 80% silver and the leanest 10% with various intermediate proportions of silver with base metals.

Silver solders are usually sold by the Troy ounce, in the form of wire, strips, sheets and filings. They are applied by means of oxy-acetylene or other welding and brazing torches. Though called "solders" their function is usually that of a brazing medium.

Manufacturing Ornamental Architectural Bronzes

A Detailed Description of the Operations Involved

By FERDINAND KRETZ
Metal Worker

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Ferdinand Kretz

BRONZE, whether it be ancient or modern, does not only beautify the parks and other public places of a large city, but many of our present day bronzes are put into office buildings, banks, and other places, in such various forms as fixtures, fonts, counter-rails, candelabra, enclosures, plaques, and many other things, in accordance with the surroundings and wealth of the community. Our modern bronzes are usually done in a commercial and competitive way, and in order to meet and cope with this situation successfully, an architect must require no little skill, ingenuity and resourcefulness in order to obtain an acceptable job that is satisfactory to all parties concerned and without too great a cost to the concern or contractor who undertakes to do this kind of work. Production or shop procedure in the manufacture of architectural ornamental bronzes begins after the verification and approval of all shop and working drawings, which show the sectional parts, method of construction, and so forth.

ORNAMENTATION AND MODELING

This particular part of the bronze arts is the fundamental basis of the whole decorative scheme and involves the creative ability and artistic taste of the architect who may be concerned. After modeling or models have been approved, the contracting firm generally takes all for granted and proceeds to manufacture ornamental bronzes.

PLASTER OF PARIS MOLDS

Plaster molds are made over the models and in some cases where undercuts occur, a plaster piece mold is resorted to in order to retain the shadow effect in the modeling. Plaster molds of any individual part or model that may be of any great depth or projection, should be backed out by a method of laying a thickness or sheet of clay against the walls and over the surface or face of mold. When covered over with plaster this will form a two part mold, back and face. When separated and the clay thickness removed, a cavity will be formed between the two into which wax is poured to form a wax pattern of even thickness, and which is usually required for good met castings. Plaster molds are used for duplication of wax ornaments as on moldings where the ornament repeats Cutting draft, or trimming off ragged edges or overhanging parts are necessary on plaster molds if a reproduction is to be made in wax and used for pattern purposes, excepting the piece mold process as previously mentioned. Great care must be exercised in the trimming of molds for if overdone, the effect of the original clay model may be lost and in some cases distort the general character of the modeling. When individual wax patterns or those used for wood pattern purpose are well bedded and properly prepared and finished, good results are obtainable in bronze castings. A thin coat of shellac on wax, facilitates its molding in the foundry.

WOOD PATTERNS

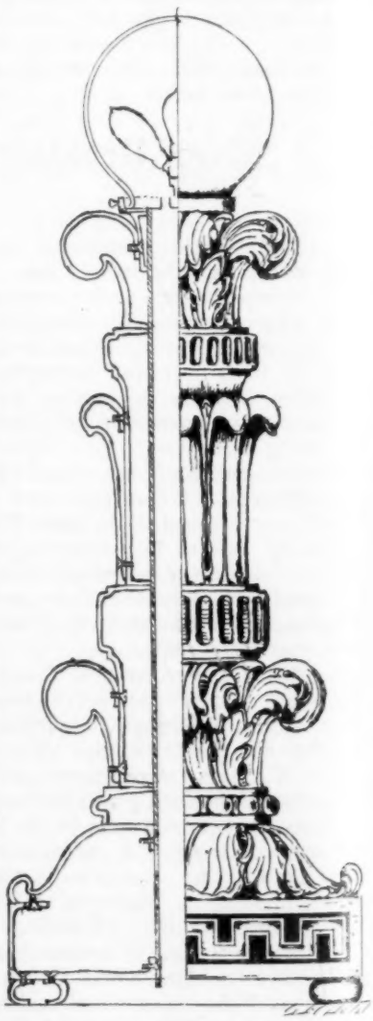
These should have clean cut lines and contours and made to fit upon a perfect bedding to prevent distortion when sand is rammed upon them in the foundry and two coats of shellac should be applied to prevent absorption of sand moisture. Kiln-dried lumber will prevent warping or twisting of wood patterns. On wood patterns having wax ornamentation, proper depth should be allowed so that when the wax is inserted it will blend well with the lines of the wood. Care must be taken to set the ornament so as to make allowance on pattern for hand or draw filing, grinding and so forth of the members that are to be high lighted on the bronze castings.

PLASTER OF PARIS PATTERNS

In principle these are the same as wood patterns except that in most cases they are swept by template and made of plaster and put into a duplicate set of interchangeable flasks to match foundry boxes for molding. When handled properly these patterns give very good results.

METAL PATTERNS

When a quantity of castings is wanted a metal pattern is made. In this case the original pattern must be sized up properly to allow for the double shrinkage in metal to take place. Metal patterns are chased to resemble the original models or patterns they were cast from and are called Bronze Master Patterns. On all patterns provision should be made for casing on



Elevational Drawing of a Candelabrum, Showing Finished Article and Mode of Construction and Fast Endings Through Sections.

all flanges, luggs, or bosses, to be used for bolting, screwing or drawing together any or all parts of the general construction, specifying bronze screws if exposed to weather conditions.

FOUNDRY

Foundry results depend a great deal upon the class of patterns tendered and their handling, quality of sand and facings, mixture of metals and finish of the mold before pouring. Albany, N. Y., sand is the best. San Diego sand is easily obtained and works well if livened up occasionally with a little clay. Facings of part San Diego and Windsor Lock sand is good on big floor work and a dusting of Windsor Lock is good on small bench wrk. Reprinting a pattern in a sand mold is necessary if good castings are desired. When a pattern has been drawn from the sand mold, the mold should be sprayed over with diluted molasses water, then dusted over properly with a coat of graphite, after which the pattern is placed back into the mold by means of guides and tapped or hammered here and there until a perfect reprint of the pattern is obtained. Better results can be obtained and gain in metal thickness avoided if the pattern is reprinted previous to ramming the cope over it. This gives a better mold surface and a more even thickness of metal and is very practical even though it is considered contrary to ordinary foundry practice. The face of the sand mold should be skin dried, preferably by means of a charcoal fire placed over it on a pierced iron plate far enough from the face of the sand mold to give it a gentle heat.

FITTING

All superfluous parts are removed and preliminary grinding done before the castings are ready to be squared off, after which the several parts, pieces, objects, and so forth are carefully fitted, mitred and joined together. This is done by means of the flanges for bolting purposes and lugs and bosses for screwing onto (as previously referred to), cast on patterns. Butt and mitred joints if properly filled and fitted and drawn together as previously mentioned, can be made nearly invisible if tooled over and closely fitted and finished before the whole construction has been taken apart for the final finishing touches which include hand drawn filing, emery belting and a general tooling and chasing over of the ornamentation. In high class work chasing is sometimes specified. The procedure necessitates a considerable amount of work on the part of a skilled artisan to either bring out or subdue effects in the ornamentation. The procedure is to first scrape and relieve the surface of a thin hard scale or crust which forms on the face of the bronze casting, after which it is tooled over or chased in such a manner as to bring out the details of the original clay model. Many fine and pleasing effects can be obtained by under-cutting or chiseling away with a V shaped parting tool, thus taking away any objectionable draft on the part of leaves, ribbons or other ornamentation.

Color finishing is usually decided by submitting various bronze samples and care must be taken to produce an even color throughout. Color finishing is done before the work is erected.

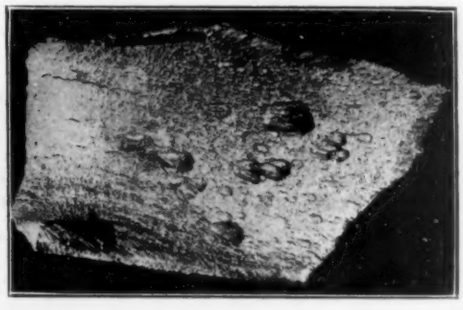
Pure Manganese Produced by Distillation

By a process of vacuum distillation, pure manganese is now being produced in the Bureau of Metallurgical Research of the Carnegie Institute of Technology, Pittsburgh, Pa., it is announced. Successful purification of the metal by the distillation process has been achieved as the result of research by Dr. F. M. Walters, Jr., director, and Drs. V. N. Krivobok and J. B. Friauf, associates of the Bureau. The purified manganese, the Carnegie metallurgists say, will be used in a comprehensive study of the system, iron-manganese-carbon. Although manganese is widely used in the steel industry, it has never been prepared in a pure form in any great quantity. The ordinary processes of reduction of manganese from its ores yield a product which is contaminated by several per cent of impurities, and the electrolytic method of refining, which is so successful in the treatment of many metals, is less readily applicable to the purification of manganese.

Metals of low melting point such as mercury, cadmium and zinc, it is pointed out, have been purified by distillation. The method of distillation developed by Dr. Walters and his associates at Carnegie is considered as significant because of the high melting point of manganese, 1,244° Centigrade. The process used at the Bureau of Metallurgical Research is described as follows:

Crude metallic manganese is placed in a pure magnesia crucible over which a similar crucible is inverted to condense the distilled metal. The crucibles are placed inside a silica tube four inches in diameter and two feet long which is closed at both ends and connected to a vacuum pump. The central portion of the silica tube is surrounded by a water cooled copper coil of about thirty turns, through which an alternating current of several amperes at a frequency of some twenty kilocycles is passed. This induces eddy currents in the manganese and heats it to the melting point. The pressure maintained in the silica tube by the vacuum pump is less than a twenty-thousandth of the atmospheric pressure. The molten manganese boils under the low pressure and sends off manganese vapor which is condensed in the upper crucible. The impurities remain in the manganese in the lower crucible, while the distilled metal which has been formed by the condensation of manganese vapor is of a high degree of purity.

The distilled manganese has a bright silvery luster which does not tarnish upon exposure to air. Unlike many pure metals which are comparatively soft and ductile, distilled manganese is extremely brittle and hard enough to scratch glass.



Sample of Distilled Manganese Produced at the Metallurgical Research Bureau, Carnegie Institute of Technology.

Samples of this material and the furnace in which it is produced were shown at an open meeting of metallurgists held in Pittsburgh on October 19, 1928, under the auspices of the Metallurgical Advisory Board, which cooperates with the Department of Metallurgical Engineering of Carnegie Institute of Technology and the U. S. Bureau of Mines in a program of metallurgical research.

Aluminum: Its Present and Future Status

A Resume of Twenty Years' Experience and the Prospects for the Future—Conclusion*

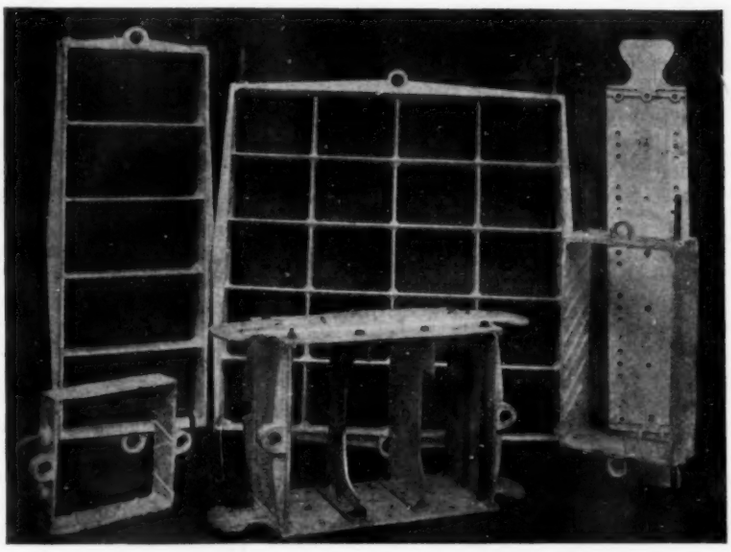
By ERNEST V. PANNELL
Technical Advisor, The British Aluminum Company, Ltd.

ELECTRIC POWER

One of the greatest and most firmly established industries in the United States is one of the most significant in its employment of aluminum as an electric conductor. To this date not less than 300,000 miles of aluminum-steel overhead cable have been installed as transmission conductors in all parts of the world, the bulk of this mileage being in this country. This, it is interesting to note, is also a development of the last twenty years. The special merits of aluminum reinforced with steel lie in its lower net cost as well as in its higher tenacity. By taking advantage of its high strength, poles and towers are spaced some fifty percent further apart than where copper wire is used. At the same time the lighter weight assists construction and the larger diameter resists corona discharge. A newer development in European practice lies in the use of a high tensile heat treated aluminum alloy wire which is stranded up into a cable of conventional type obviating the use of steel. Such a conductor alloy now being employed in France under the name of "Almelec" has a weight 54% that of the equivalent copper and a tensile strength 50% greater. A considerable field lies in the development of such a conductor in the near future simultaneously with the rapid extension of electric power networks. In Great Britain, France, and Germany at the present time power lines are being constructed at a record rate in most of which aluminum conductors are used. Since the average section of conductor may be taken as 300,000 cir. mils with a weight of 1,500 pounds of aluminum per

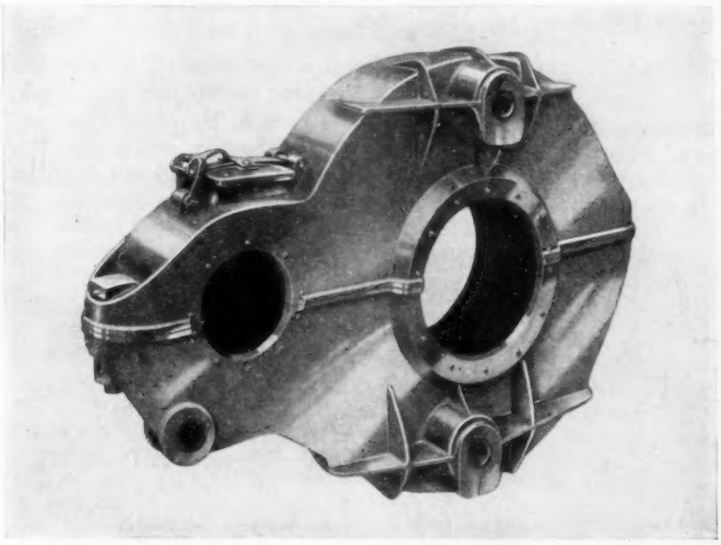
Aluminum Sheet and Moldings for Store Front Architecture

*Part 1 was published in our January issue.



Light Alloy Foundry Flasks

mile the construction of a considerable system of several hundred miles using six conductors involves an approximate tonnage of metal amounting to 450 tons for every 100 miles of route. The demands of high purity aluminum for this purpose are growing fast and are still further stimulated by the present relatively high price of copper. At the time of writing, a given conductor of aluminum shows an economy of some thirty-five percent over the equivalent copper.



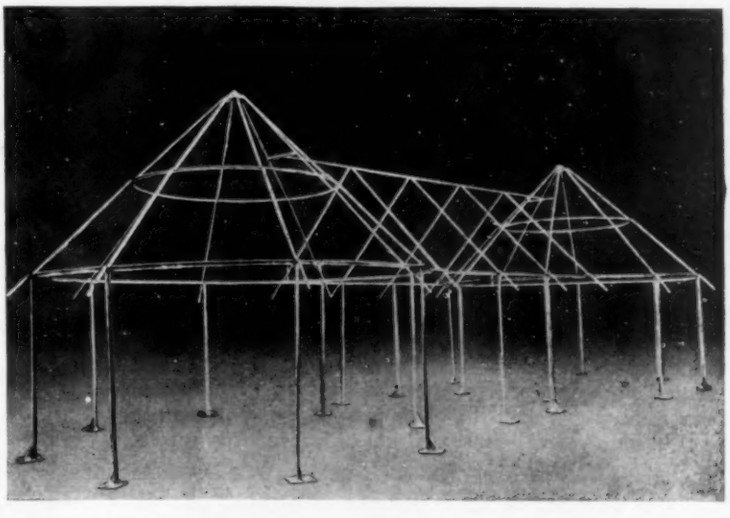
Light Alloy Gear Case for Street Railway Motor.

OTHER INDUSTRIES

Striking advances have been made in the use of aluminum during the past year in a wide variety of industries. Collapsible tubes of a specially pure grade of aluminum are now being fabricated in many thousands per day for the packing of shaving creams, cosmetics, and greases. Such tubes were formerly made exclusively of tin but with the heavy metal standing at exactly double the price of aluminum and weighing two tnd three-quarter times as much, its cost is five and one-half times that of aluminum. Commercial developments may very soon be expected in the use of aluminum plate of a similar nature to tinplate. Such sheets are already being rolled by two different processes and may be found valuable to the canning industry. The successful plating of chromium on aluminum is a result of the past year's research and the plating of aluminum on other metals is also responding to experimental work.

The manufacture and use of aluminum foil are rapidly extending by reason of improvements in manufacturing methods and the considerable economy over tin. In Europe a thin layer of aluminum is produced on a paper base and is widely used for decorative purposes, magazine covers and as a wall covering. A further European development lies in the decorative architectural uses of the light metal particularly in departmental stores and show rooms. Metallic panels grained and figured in striking designs are incorporated in some of the most important stores on the Champs Elysees in Paris, while the Galeries Lafayette uses aluminum gates of unusual beauty. In this country such notable architectural details as the massive urn and columns surmounting the Standard Oil Building in New York, the spire of the Protestant Evangelical Church in Pittsburgh, and the twin figures of the Sphinx on the new courthouse in St. Louis are indications of the service of aluminum to architecture. For many years the possibilities of the metal in this field have been neglected but there is now a tendency to employ castings made in a non-corrodible light alloy to a wide extent.

The foregoing has briefly outlined only a few of the many new uses for aluminum which have made the 1928 consumption of the metal a record. A policy of expansion is being followed by the various European producers, new plants being constructed at a number of sites. What is known as the Lochaber plant near Fort William in Scotland will probably be operating in the coming year and will constitute one of the greatest producing plants in the world having a potential capacity in excess of 100,000 horse power. The reflection of production on price, however, is not very marked because of the considerable consumption of electrical energy going into a ton of aluminum which exceeds by four or five times that required to reduce any other common metal on a commercial scale. In the early days of the industry it was possible to develop hydroelectric power at an investment of around $100 per horse power installed. Since that time not only has the cost of machinery and construction advanced but the most desirable of the world's water power sites have been taken up. For this reason, at the present day, the capital cost is of the order of $250 to $350 per horse power. This naturally has a direct bearing on the cost of energy per kilowatt hour and of any product dependent thereon. The writer would give his opinion that such economies as can be effected on a production scale will be reflected in the price of the metal but most statements that a radical reduction can be expected are quite without foundation.



Light Alloy Tent Frame for Tropical Countries.

A Study of Chromium Plating

Excerpts from a Bulletin Giving an Account of the Research Work Done on Chromium Plating at the University of Michigan During 1927 and 1928. Information Has Also Been Compiled from Scientific and Patent Literature*—Part 1

By RICHARD SCHNEIDEWIND
University of Michigan, Ann Arbor, Mich.

A NON-TECHNICAL ACCOUNT OF CHROMIUM PLATING FROM CHROMIC ACID BATHS

THE adoption of chromium plating as a commercial process has proceeded with surprising and increasing rapidity in the last five years. Manufacturers everywhere have found the public quite ready to accept the bluish brilliance of chromium as a standard of elegance and good taste. Coatings of this metal have been used to decorate radiator shells, bumpers, and headlamps on automobiles, plumbing fixtures, household appliances, and even jewelry. Not only is chromium attractive for its luster, but unlike other metals used for the same purpose its brightness is not dimmed by weather, nor is it tarnished by atmospheric conditions, nor by the smoke and fumes ordinarily found in big cities. In the case of automobile fittings especially, chromium plating is applied also as a means of protecting the base metal, usually steel, from rusting. A very thin coating, even a few hundred-thousandths of an inch in thickness, when applied over the usual nickel plate, will increase the resistance to corrosion two or three fold. These qualities have been responsible for the increasing popularity of chromium plating.

Richard Schneidewind

PROPERTIES OF CHROMIUM PLATE

Electrodeposited chromium is a bluish metal which, if properly applied, has a brilliant luster quite similar to that of polished platinum. Chromium in thin layers is used to improve the appearance of a surface and also to prevent corrosion of the under-metal. In thick layers it is used to increase resistance to wear. Chromium plating on steel without intermediary coatings of copper, nickel, or other metals, however, is of little value in protecting against corrosion due to the extreme thinness of the deposit and its tendency to be porous. Ollard[84] made quite an extensive study of the corrosion resistance of multiple coatings such as nickel-chromium, cadmium-copper-chromium, copper-chromium, and many others on steel. Certain of these combinations are described in various patents. Ollard found that a simple chromium plate did not appreciably protect the steel from rusting, whereas the multiple coatings improved greatly the effectiveness of the coating. Baker and Pinner[104] found that unless the undercoating or coatings were of moderate thickness the plate would corrode rapidly. This was found especially true where the undercoating was copper. Baker and Pinner also found that increasing the thickness of the chromium deposit over a nickel-copper-nickel undercoating up to a certain point increased the resistance to corrosion proportionately. This was due to the fact that a heavier coating is less apt to be porous than a thinner one. Beyond this optimum thickness the rust resistance of the plated piece decreased in a way that had not been anticipated. They found on examination that the chromium deposit had formed microscopic cracks which made it of little protective value. Grant and Grant[103] published some very interesting pictures of the structure of heavier layers of electrodeposited chromium which exhibited cracks visible even at fairly low magnification.

Chromium is not only useful as a protective covering against rust; it is used also in thick layers to impart greater durability and wear resistance to moving parts of machinery and like equipment. Examples of this type of application are found in automobile parts, such as wristpins and steering-knuckles, brake parts, and in stamping-dies, extrusion-dies, roller-faces, and plug-gages.[102]

There are two characteristics which distinguish it from other metals and fit it peculiarly for such service. These are its hardness and its smoothness. According to the mineralogists' scale it has a hardness of 9, which means that only corundum and diamond can scratch it. Payne[b] gives the following table of comparative scratch hardness which will give a fair idea of the hardness of chromium as compared with other metals:

Chromium	2000
Case hardened steel	1950
Steel shafting	750
Swedish iron	408
Cobalt	625
Bronze	244
Babbitt	208
Copper	78

As for the "smoothness" of chromium, its coefficient of friction is extremely low,—so low that greaseless bearings[b] have been made in which the sliding surfaces carry a fairly heavy coating of the metal. It is doubtful, however, whether this procedure could be used commercially in very many places.

The greatest defects in thick coats of chromium is a result of its metallographic structure. This leads to a pronounced tendency for the metal to crack when struck a blow or when a varying load is applied to it. Some of this tendency to crack can be ascribed to inherent brittle-

* Complete copies of this publication can be obtained by writing for A Study of Chromium Plating, Engineering Research Bulletin No. 10, to the Department of Engineering Research, University of Michigan, Ann Arbor, Mich., Price, $1.

[84] Metal Industry (London) 27: 70-79 (1925).

[a] U. S. P. 1614303 (1927).
U. S. P. 1578254 (1926).
U. S. P. 1615585 (1927).
U. S. P. 1651278 (1927).
U. S. P. 1587293 (1926).

[104] Jour. Am. Soc. Auto. Engrs. March (1928).

[103] Trans. Am. Electrochem. Soc. 53: Preprint (1928).

[102] Am. Soc. Steel Treating 12: 921-945 (1928).

[b] U. S. P. 1600961 (1926).

ness. Treatments such as heating or heating in a vacuum to remove occluded hydrogen, formed during the plating process, have been suggested and may be of some value.

On polishing a cross sectional specimen of heavy chromium plate, and examining it under a microscope there will be found a large number of voids in the deposit. In some cases these voids will happen to be so aligned that a crack or fissure extends all the way down to the base metal. Although usually the holes are not so connected it is obvious nevertheless that such a material, rather brittle to begin with, can not withstand shock.

There is undoubtedly some correlation between plating conditions and the number of voids in the resultant deposit. This, however, has not yet been fully investigated. A few isolated tests by the author would lead to the conclusion that the hotter the bath, or in other words the more rapidly the metal is built up, the more pronounced the voids which will result in the deposit.

THE PROCESS OF ELECTRODEPOSITION OF CHROMIUM

Electroplating in general is accomplished by passing an electric current from one electrode to another through a bath containing in solution the metal which it is desired to deposit. For example, in nickel plating, a nickel rod is used as the positive electrode, while the object to be plated becomes the negative electrode. These two poles are immersed in a bath of nickel sulphate or other suitable salt of nickel and an electric current is passed through the solution. The current causes the nickel rod to dissolve gradually and replenish the bath from which nickel is simultaneously being deposited upon the surface to be plated. In this manner a cycle is set up: nickel rods, called anodes, and current are constantly supplied to the process, and in return nickel is obtained as a coating upon the objects hung in the bath.

The deposition of all metals follows very definite laws. Normally a certain amount of electric current will transfer a definite amount of metal from anode to cathode, the article to be plated. If less metal is deposited than should be theoretically obtained, it is said that the cathode current efficiency is low. Cathode current efficiency can, therefore, be expressed as the ratio between the amount of metal deposited and the amount theoretically calculated and is reported in per cent. Anode current efficiency is the ratio between the amount of anode actually dissolved and the theoretical amount.

Anodes—In most plating processes new metal is supplied to the bath in the form of anodes which dissolve in the solution at approximately the same speed as that at which metal is being deposited from the solution. There are only two well known exceptions to this procedure, which are found in the electrodeposition of platinum and in that of chromium. Here, insoluble anodes are made use of, and the bath is replenished by means of metallic salts.

Soluble anodes of chromium metal, however, are not entirely unknown. In 1923, Wolff[66] advocated the use of such anodes in chromic-acid plating baths, and gave a method for their production by means of pressing powdered chromium into desired shapes and sintering. Soon afterward Coignard[68] described the successful use of ferro-chromium in chromic-acid baths, although Sargent[44] had not found them satisfactory. Schwartz[53] favored both of these materials.

Important objections, however, to the use of soluble anodes in chromic-acid baths have recently been raised by Haring and Barrows[99] and by Watts,[100] who found that the current efficiency of chromium and ferro-chromium anodes is much greater than the cathode current efficiency. This means that during electrolysis chromium goes into solution at a more rapid rate than that at which metal is depositing out from the solution. Hence, the concentration of chromium, especially the trivalent chromium, builds up rapidly and the bath becomes inoperable.

Only in solutions of divalent and trivalent salts of chromium have chromium anodes been found entirely satisfactory. But even in baths of this nature insoluble anodes have been described. Moeller and Street,[16] Cowper-Coles,[22] Carveth and Mott[31] and others used lead anodes in solutions of chrome alum or chromic chloride.

Hambuechen[c] fully realized the fact that with soluble anodes the bath would rapidly become too rich in chromium. In order to surmount this obstacle he patented an ingenious process for using insoluble anodes of lead in conjunction with auxiliary soluble anodes of chromium. When the chromium concentration fell below a certain predetermined figure, the auxiliary anodes were introduced into the bath and were removed when the bath composition was satisfactory.

In the majority of installations insoluble anodes were used. The researches of Watts[100] definitely narrowed the selection of possible materials to two: iron or lead. If lead anodes are used, the bath will be maintained in a very good condition because trivalent chromium formed during electrolysis is readily reoxidized by lead anodes. Some grades of lead, however, corrode in such a manner that adherent patches of lead chromate are formed which exert a detrimental effect upon the plate. Iron anodes on the other hand always remain clean. They permit, however, a greater accumulation of trivalent chromium in the bath than lead anodes. Moreover, iron goes into solution. The more pure the iron the slower will be the rate of solution. Iron in the bath increases its resistance and thereby increases both the power necessary for plating and the attendant power costs. These factors must be considered in making a choice of anode materials. If properly taken care of, lead anodes are preferable.

Tanks—The bath may be contained in a lead-lined wooden vat, or in a glass-lined steel tank but a common procedure is to use a steel tank in which the joints are lapped and welded inside and out. Steel and iron becomes passive in chromic acid and are but very slightly attacked. As has been pointed out before, sheet-lead or sheet-steel anodes may be hung in the bath or, in the case of a steel tank, the tank itself may be connected anodically. Heating and cooling coils are usually installed in order that the temperature may be controlled readily.

The deposition of chromium is attended by a copious evolution of gas,—hydrogen and oxygen mixed with a spray containing chromic acid. This fume is very irritating to the mucous membranes; exposure over a long period of time leads to bad head colds, nose bleed and even ulceration in the nasal passages. For this reason fume ducts are generally installed very near the surface of the bath. Exhausting fans pull the fumes directly across the solution and downward. In earlier equipment it was attempted to pull the fumes upward but due to the density of the spray this method did not function satisfactorily. European installations sometimes are equipped with traps to collect the spray, which is returned periodically.

This article will be continued in an early issue.—Ed.

[b]Loc. cit.
[66]D. R. P. 422461 (1925).
[68]Fr. P. 571447 (1924).
[44]Trans. Am. Electrochem. Soc. 37: 479-496 (1920).
[53]Trans. Am. Electrochem. Soc. 44: 451-463 (1924), also U. S. P. 1589988 (1926).
[99]Bureau of Standards Technologic Paper 346.
[100]Trans. Am. Electrochem. Soc. 52: 177-185 (1927).
[16]B. P. 18743 (1899).
[22]Chem. News 81: 16 (1900).
[31]Jour. Phys. Chem. 9: 231-256 (1905).
[c]U. S. P. 1544451 (1925).
[100]Loc. cit.

Medieval Drinking Vessels

This is the Third of a Series of Articles on Drinking Vessels of Olden Times

By A. F. SAUNDERS,
Designer, Benedict Manufacturing Company

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

SOME of the finest examples of the art of goldsmithing are to be found in the drinking vessels of the Middle Ages, and it is to be deplored that so few of these masterpieces in the precious metals escaped the melting pot during the religious strife of the early Christian era. But those examples which fortunately have been preserved, provide ample proof of the high artistic quality and superb workmanship of the medieval craftsmen.

Among the most important drinking vessels in use during those remote times were the chalices or communion cups of the church, the hanaps or standing cups of the nobility and the mazer bowls or wine cups in general use in England during the middle ages.

THE CHALICE

According to the growth from poverty of the early Christian church, chalices were made first of wood, horn or ivory, then of agate and glass and later of gold or silver and it is interesting to note that as early as the Eighth century a Church Council in England forbid the use of wood, horn or glass, deciding that "henceforth gold and silver only should be used as the material for the making of those vessels receiving the consecrated wine."

In the early ecclesiastical service the term "Chalice" always conveyed the meaning of a chalice cup and paten combined, because at that time the paten was designed to form the cover, and not the foot, as is sometimes erroneously stated by those describing this sacred vessel.

The Chalice varied in size according to its use, the smaller mass chalices being appointed for the ordinary use on the altar, while the large pontifical cups were reserved for festive occasions and on account of their size were sometimes fitted with two side handles on the upper part of the body of the cup to facilitate their handling. The so called Ardagh Cup of about the tenth century, illustrated on Plate 1, No. 2, is considered one of the finest examples extant of early Irish metal work. This chalice cup is of the two handled type used in the earlier Christian church. The principle parts of the cup are hammered up out of silver, while the decorative features are worked out in gold, bronze, enamels and precious stones.

The chief decoration is the ornamental band running around the upper part of the body of the cup. It is composed of twelve gold panels with bosses carrying cloisonne enamels between. All these panels are decorated with interlaced patterns, first worked in repoussé and then, to make them even more interesting, they have the finest of filigree wires soldered into the front.

The finest chalices made during the Romanesque period were of large proportions with a wide spread foot of circular outline, a cylindrical stem divided by a central knob to assure a firmer hold when grasped by the hand. The body of these early chalices was always in the form of a half ball and of generous capacity. The decorative features usually consisted of the most skillfully applied filigree work of fine gold or silver wire plaited and formed into delicate arabesques and flower forms, which was further enriched by settings of precious stones, a type

Plate 1—Types of Drinking Vessels

of ornamentation developed by the Byzantine goldsmiths. Fig. I Plate 5 illustrates an exceptionally fine gold chalice of this kind, made sometimes during the thirteenth century and now forming a part of the treasure of a church in Bergen, Norway.

With the development of Gothic art during the fourteenth and fifteenth centuries, a change took place in both form and decoration of the chalice. Conforming to the laws of Gothic architecture, the general form of the vessel became slimmer, the foot became hexafoil or six sided instead of the round form of the Romanesque style. The stem knob was furnished with six round or cornered peg shaped projections as indicated on No. 2, Plate 2, or purely architectural features surrounding saintly figures executed in high relief, and further embellished with jewels as shown in the fifteenth century chalice of German workmanship, No. 4, Plate 1, and it may also be noted that the body of the cup becomes cone or funnel shaped in place of the half-ball form of the earlier Romanesque style.

THE HANAP

The term "hanap" in medieval times applied to standing cups of large size and fitted with a cover, and the extreme finish and elaboration of ornament, by its mere costliness, indicates clearly how highly this form of drinking vessel was prized, for it figured among the most cherished possessions of the nobility and gentry of those remote times.

The name hanap is of Anglo-Saxon origin, dating back to the eleventh century and the finest examples of these curious cups are of German or Flemish workmanship. They were made of various materials but those of gold, silver or ivory represent the most remarkable proficiency in both artistic design and fine craftsmanship. These massive cups occupied the position of honor at all important state functions when royalty and the nobility gathered around the festive board. Little wonder then that the most precious materials and finest artistic skill was employed in their making.

In those ancient times the chasers' and repoussé workers vied with each other in the decoration of their work, and while the object was perhaps more often heavily loaded with ornamentation, it was generally in good taste and superbly designed and executed. The Hanap illustrated as No. 5, Plate 1, is an example of the extremes to which medieval craftsmen often carried their ornamental work. This cup of silver parcel gilt stands over eleven inches in height, with a diameter of 4 inches. The body is bell shaped highly decorated in repoussé, diaper design, composed of slanting and parallel bands, forming diamond shaped panels which are filled in with animals, masks, fruit and flowers. The standard and foot are richly chased with floral and scroll work, and the cover which is a portion of a polished cocoanut shell has an embattled silver rim and is surrounded by a miniature figure in silver gilt of St. Christopher bearing the infant Saviour.

MAZER BOWLS

The most popular form of drinking cup in general use in medieval England was the so called mazer bowl, a bowl shaped cup made in its earliest form from the pollarded and consequently knotty portions of the maple tree, and owing to the fibrous texture and extremely hard quality of this material these bowls were almost imperishable and capable of a high degree of polish which brought out the great beauty of the spotted or birds-eye markings of the wood. It is from this curious spotting that the Mazer derived its name, from the old Dutch word "Masa" meaning "a spot" or "spotted." While the humbler folks of medieval times were content with the unadorned turned wooden drinking bowl, those of the wealthier families were richly embellished with mountings of gold, silver or silver gilt. The principle decorative features consisted of a chased or engraved band surrounding the lip of the bowl and extending down the body from one to one and a half inches and usually containing an appropriate motto.

To add strength to the bottom of the bowl and perhaps also to hide the marks caused by that part of the

Plate 2—Medieval Bowls and Cups

turners lathe which held the wood firmly against the turners tool, a small disc of silver was inserted. This "print" or "boss" as the disc is called was usually engraved and enameled with a sacred emblem or heraldic device.

In size these mazer bowls varied in diameter from five to nine inches and in height from one and a half to four inches. Although many of the bowls made at the end of the fifteenth century were much larger and often equipped with a high foot which shows clearly the close relationship between these old medieval drinking bowls and the great punch bowls and wine cisterns of the Georgian era.

That the mazer long retained its importance as a drinking vessel is evidenced by the frequent reference made to it by the early poets. The celebrated Spenser for example wrote "A mighty mazer bowl of wine was set" and a passage from old Ben Jonson says, "Their brimful mazers to the feasting bring." Both of these quotations refer to the large type of standing mazers used as containers at the feast rather than the small sized individual drinking bowls described above.

A considerable number of medieval mazer bowls are still in existence, preserved chiefly in museums and the colleges of England. Several of the best examples of these favorite drinking vessels of "Ye Olden Times" are to be seen in the fine collections of medieval craftsmanship in the Victoria and Albert Museum of London. The fine pair of mazers shown on Plate 2 are a part of the collection of medieval art owned by the British museum.

The fourth article of the series will describe some of the most interesting types of drinking vessels of the Renaissance Period.

Hardener for Babbitt

Q.—Kindly advise us what is the cheapest hardener that can be added to lead to make No. 4 babbitt. Do storage batteries contain any other metal besides lead?

A.—The cheapest and best hardener to add to lead for No. 4 babbitt is antimony.

Storage batteries contain antimony as well as lead.

—W. J. Reardon.

Acid Handling in a Metal Finishing Plant

A Description of the Large and Carefully Planned Metal Pickling Plant of the Siemens-Schuckert-Werke in Siemenstadt, Germany—Conclusion*

By PERCY C. KINGSBURY

Chief Engineer, General Ceramics Company, New York

TRANSLATED FOR THE METAL INDUSTRY WITH SOME CHANGES AND REVISIONS FROM AN ARTICLE BY PAUL H. PERLS, MANAGER OF THE SIEMENS-SCHUCKERT-WERKE, IN "WERKSTATTSTECHNIK."

THE vats are so arranged that the nitrous fumes evolved during pickling are completely drawn off so that the operators are protected from inhaling dangerous gases. The water overflowing from the rinsing vessels passes around the stoneware vessels holding the dip in order to prevent as much as possible a rise in temperature, and also to dilute the acid that splashes over during the pickling process. Each of these suction vats is ventilated by a special stoneware fan, having a capacity of 4200 cubic feet per minute, installed in room E (Fig. 3 and Fig. 8). The suction hoods are so designed that the workmen can conveniently dip the parts in the acid. For perfect ventilation it is important to replenish the exhausted air with fresh air. This is best done by forcing in fresh air by means of blowers. As shown in Fig. 3, fresh air is drawn in from the outside by means of a built-in channel P and conveyed to the pickling room through a stoneware pipeline R by means of a centrifugal fan Q. In order to obtain an equable temperature during the winter months, the injected air is preheated in a special radiator S. It is inadvisable to supply air through the windows as the nitrous gases may be blown out from under the hoods by a draft and prove offensive to the

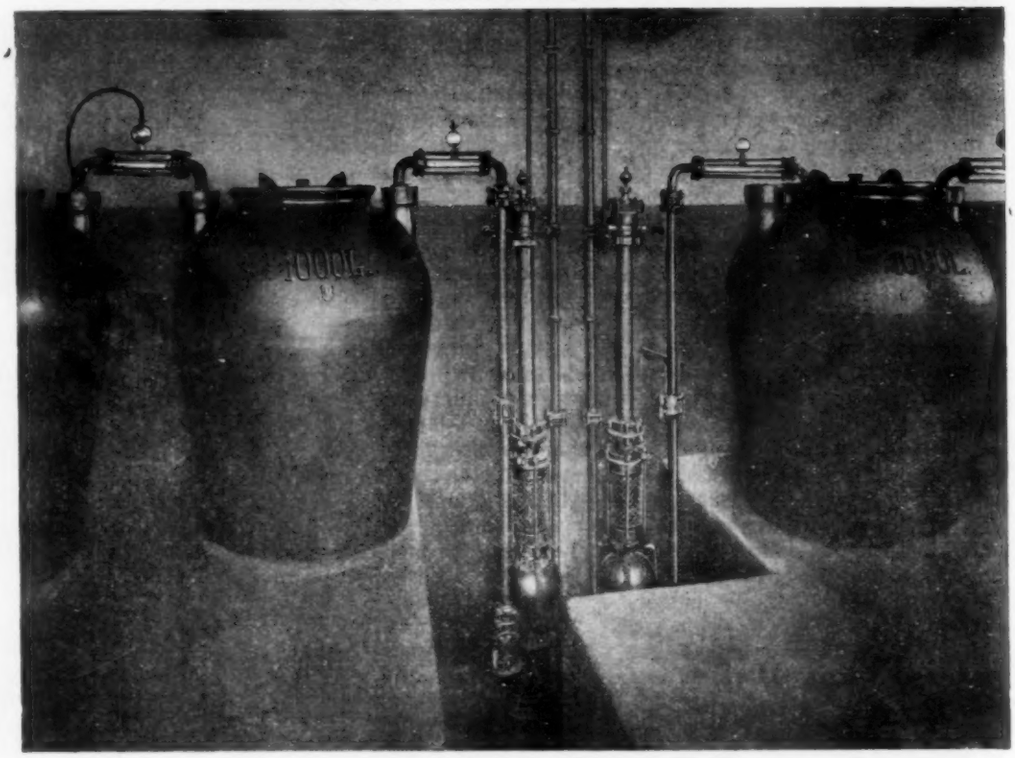


Fig. 6—Pickling Apparatus

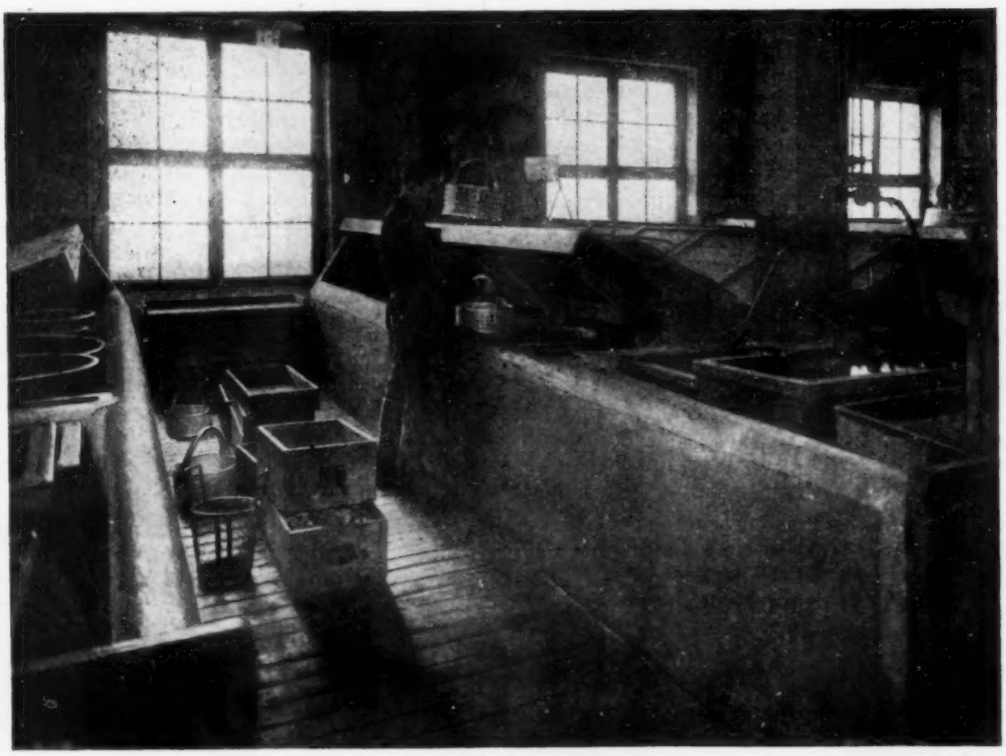


Fig. 7—Acid Dipping Vats

* Part 1 was published in our January issue.

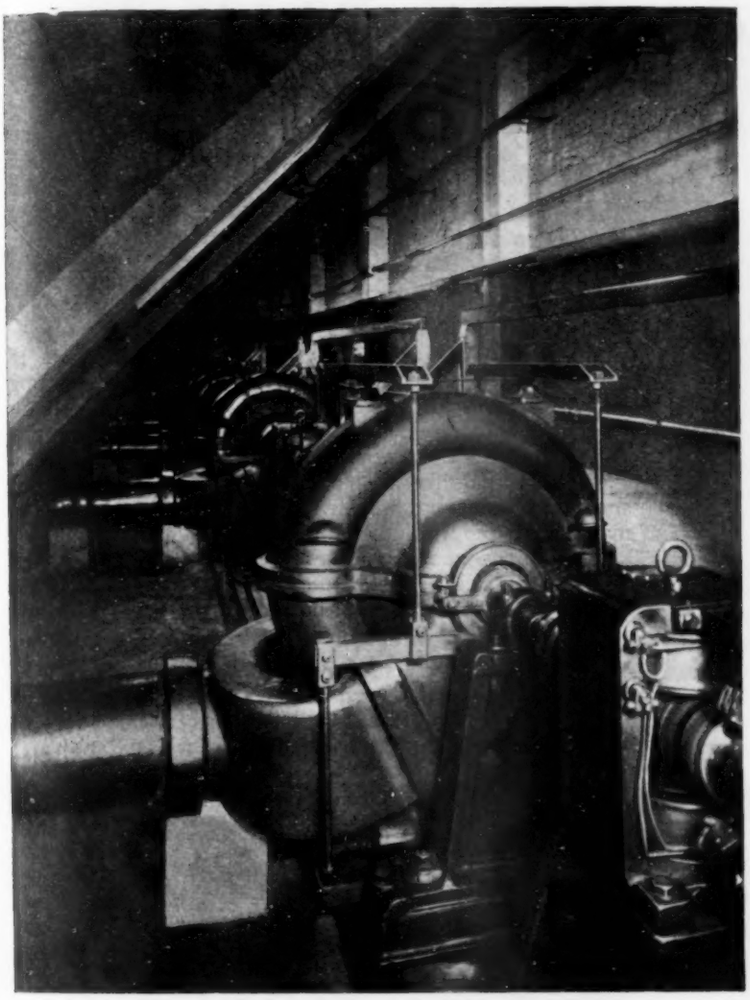


Fig. 8—Exhausters for Removing Acid Fumes

workmen. The nitrous fumes drawn off during the pickling are forced into the neutralizing room F by the stoneware fans referred to above. At the points where the acid fumes enter, a number of stoneware or lead jets are provided which spray the fumes copiously with water. The acid in the corrosive gases is entrained by this atomized water, drops with it to the floor and flows through a gutter in the floor to the neutralizing equipment. The room is vented at the point farthest from the inlet openings so that the incoming corrosive fumes, moving at a low velocity may be exposed as long as possible to the atomized water sprays.

NEUTRALIZATION OF ACID

Of no less importance than the removal of acid from the exhaust fans is the neutralization of acid in the effluent. This may be done in various ways, as for example passing it over slaked lime or over a suitable quantity of iron filings.

The latter method is recommended as the copper contained in the acid waste liquors can thus be recovered. Contrary to the usual methods for the removal of copper, using wooden vats which constantly leak and need repair, the removal of copper in this installation is effected in stoneware vessels which are not subject to wear and deterioration (Fig. 2, see also Fig. 9). The principle of the process is as follows: The copper content of the waste liquor flowing through the vessels is precipitated by means of cheap iron turnings in the form of a copper sludge.

This copper sludge is removed from the vessels at intervals of about eight weeks. The plant requires very little service as the vessels are charged and emptied while in operation.

The cost of operation is very low in comparison to the yield. The number of vessels required depends upon the volume of effluent. As illustrated in Fig. 2 and Fig. 9 the arrangement consists of four rows of six vessels in cascade through which the cupreous waste liquor constantly flows.

Aside from the profit on the cement copper the installation also neutralizes to a considerable extent the waste liquor. The acid content being greatly reduced by the iron turnings, only small quantities of lime are necessary to neutralize completely the effluent from the copper leaching plant.

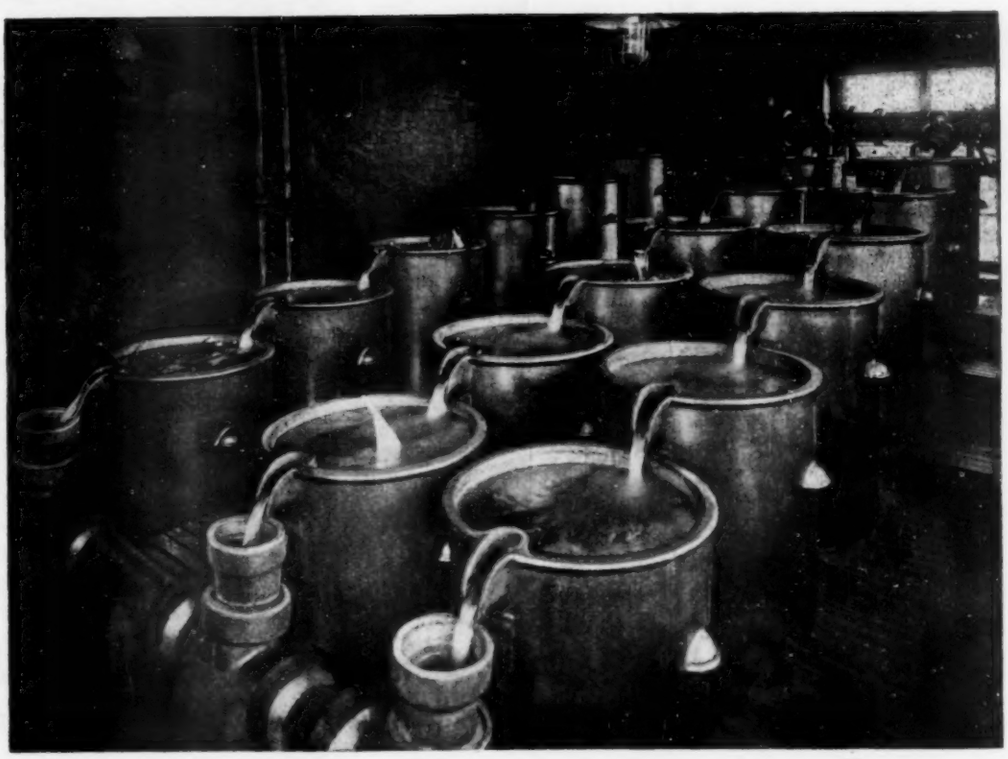


Fig. 9—Vessel Arrangement for Recovering Copper from Acids

A Few Facts Relative to the Polishing Wheel Industry

Explaining, in Part, the Manufacture of Buffs on a Production Scale—Part 2, Conclusion*

By JAMES J. MANDERSCHEID,
President, Advance Wheel Manufacturing Company, Inc., Chicago, Illinois

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

SHEEPSKIN POLISHING WHEELS

Sheep are difficult to raise, storms have annihilated large herds of them and still the demand for good sheepskins increases. Manufacturers of coats, gloves, shoes and other leather articles are bidding for this leather in large quantities.

Domestic sheepskins are obtained from the packing houses in the middle west but a great many are imported from Australia, Africa, New Zealand and other countries. South America is the largest contributor of those mentioned but the largest part of these skins are shipped to the pulleries of France where the wool is removed from the skins.

Not all sheepskins can be used in the manufacture of sheepskin polishing wheels. The reason for this is that after the hide is tanned, hard spots in the hide are detected which indicates that the animal was injured. These injuries show up after the hide has been tanned in the form of hard spots, and if this part of the skin is at any part of the face of a sheepskin polishing wheel, the face of the wheel will glaze and will not hold the emery grain as would good soft sheepskin leather. On very heavy skins a light colored streak shows up in the centre of the hide. This indicates that the hide has not been thoroughly tanned, and this light colored streak acts the same as a sore spot in a hide. The only difference is that the skins not tanned all the way through are worse in that the hard streak appears the entire circumference of the wheel.

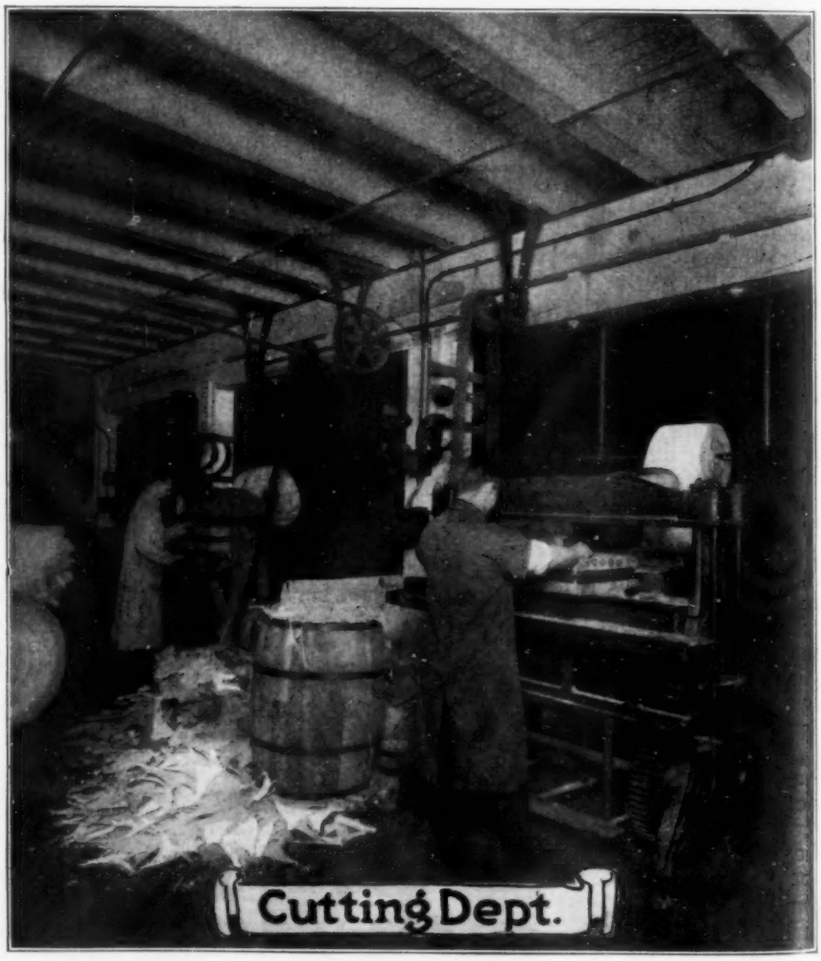
Care must also be taken that the sheepskins used in the manufacture of sheepskin polishing wheels are not burnt or tender. Burnt or tender skins are easily torn and this is caused by over-tanning. Sheepskin polishing wheels made of this kind of leather are short lived, the face tears out in spots necessitating truing up the wheel again which naturally causes the loss of some of the original diameter.

In the manufacture of shoes, traveling bags, etc., split leather can be used, that is, a leather with the grain side of the skin removed. In the manufacture of so-called domestic chamois which is none other than sheepskin tanned in oil, a split leather must be used. But in the case of sheepskin polishing wheels it is impossible to make a wheel of a split sheepskin and expect it to hold its shape. If a sheepskin polishing wheel were made of a split sheep skin though it may be perfectly round at the start, a few minutes run on the polishing lathe at a speed of 1,000 r.p.m. would render it useless, in that, it would stretch entirely out of shape due to the fact that the grain of the skin was removed which, by the way, is the back-bone of all leathers. In the manufacture of sheepskin polishing wheels, whether they are made for polishing, buffing or coloring, the original thickness of the skin must be used.

To the reader, it would seem an easy matter to buy sheepskins that are to be used in the manufacture of sheepskin polishing wheels. On the contrary, it is a matter that requires long experience. The size must be taken into consideration, holes that appear here and there, hard spots, thickness, flexibility and last but not least, the skin must be thoroughly tanned.

BALANCED SHEEPSKIN POLISHING WHEELS

Some metal finishers are of the belief that if they buy a full disc sewed and cemented sheepskin polishing wheel, that is, a wheel free from pie shaped pieces which are laid out to the center of the wheel, they will get a better



In the Cutting Room of a Buff Plant

*Part 1 appeared in the issue of January, 1929.

balanced wheel than one of pieces. This is not true and it is easily understood when you take into consideration that sheepskin leather comes uneven in thickness. For instance, at the neck of the animal the skin will run heavy while at the back-bone it runs thin. When cutting out the discs for this class of wheel one side of the disc might be heavy while the opposite side will be thin.

If there is no effort made on the part of the manufacturer of sheepskin polishing wheels to balance the discs or sections, whether pieced or full disc, then of course neither one will balance; but if the sections or discs introduced in a sheepskin polishing wheel made of full discs or pieces are balanced prior to their being assembled into a polishing wheel, then one will balance just as well as the other.

The usual method of balancing the discs or sewed sections of sheepskins wheels is to take a given amount of discs or sections and place them on a balancing device. These discs or sections are then turned one or two at a time until they balance at four different points of the periphery. They are then marked so that all these discs or sections will be cemented in the same position as when they came from the balancing device.

If the above method is not employed, some artificial weight such as lead balls must be used. The latter method of balancing is dangerous. The reader must take into consideration that we are working with leather discs and not steel or brass discs. The latter would be easy to balance by boring.

LEATHER MEAL—A BY-PRODUCT OF SHEEPSKIN POLISHING WHEELS

Leather meal is closely related to polishing wheels in that it is being used in tumbling barrels by ball bearing manufacturers to polish the balls to a high lustre, by glass fuse manufacturers, etc.

The approximate waste of the material used in the manufacture of sheepskin polishing wheels will measure between 12 per cent and 14 per cent. This waste is run through a mill and shredded into leather meal. This leather meal comes in three standard sizes, No. 1, in pieces of ⅛ inch by ⅛ inch, No. 2, ¼ inch by ¼ inch and No. 3, ½ inch by ½ inch. Other sizes can be shredded in the same mill by changing the screens.

BULLNECK POLISHING WHEELS

Bullneck leather polishing wheels are the most difficult polishing wheels to manufacture. The reason for this is the wrinkled condition and uneven thickness of the leather itself. Care must be taken that the leather does not contain too much "dope" (greases) for if the leather is loaded with grease it not only makes up a heavy polishing wheel but it makes it difficult for the emery glue to adhere to the face properly. Bullneck properly tanned should be of the rough leather type, that is, a leather free from greases with a fibre that has a close resemblance to English tanned walrus leather, dry in appearance.

In the manufacture of this product, the discs, after they are cut from the hide, are "skived" or shaved off on both the flesh and grain side. This is to permit the cement to penetrate into the pores of the leather. If the pores of the leather on both sides of the discs are not properly opened, the possibilities are that the wheel will come apart. These wheels are placed under a pressure of approximately two tons after which they are bored, machined on the sides to make them an even thickness the entire circumference of the wheel, turned and sanded down to give the face a knap that will permit the emery glue to penetrate properly.

CEMENTING POLISHING WHEELS

There are several reasons why a straight animal glue should not be used to glue the discs used in polishing wheels together. One reason of importance is that animal glue, after it has set or dried, forms a hard layer or ridge between the layers of the discs. This hard ridge is objectionable due to the streaks it leaves on the work polished. This hard ridge of glue does not wear down with the stock as it should. The result is that after the emery on the face has served its purpose and has been removed by constant polishing, the face has a corrugated appearance, whereas it should be smooth. Another important reason is that glue, being an animal product, like meat, has a tendency to sour or decay in the innermost part of the wheel where the air could not penetrate sufficiently to dry out the moisture that originally made the glue into liquid. If the moisture does not escape from every part of the wheel, the glue will sour, throwing forth an odor similar to the smell of ammonia. When this happens the wheel will come apart and any amount of glue to re-glue the wheel together again will not correct the condition, due to the fact that bacteria have settled in the undried portion of the wheel and will decay any other application of glue that is used.

CONCLUSION

There are other polishing wheels, such as wood polishing wheels, quilted, canvas wheels, quilted sheepskin wheels, laminated felt wheels, loose wheels sewed once around the hole, etc. that the writer would like to cover, but space does not permit. Wheels covered by this article are wheels most generally used in the polishing room and only a few points of importance have been considered.

Peeling Nickel Plate

Q.—We are sending you under separate cover two barrels for an ice cream scoop, and a sample of our nickel solution. A manufacturer of our city has had some difficulty in having these barrels nickel plated. It appears the barrel, when placed with the trade, stands up for a few days, after which the nickel starts to peel near the shoulder of the barrel. We are under the impression that this is due to some reaction between the brass barrel and the nickel silver knife which is soldered onto the barrel.

We have plated a half dozen samples of this scoop. The barrel is cut down and polished highly with the buff and is chemically cleaned with Wyandotte metal cleaner and then is thoroughly rinsed in water and dipped in weak cyanide solution to remove any tarnish that may appear. It is then cleaned by hand with lime and again thoroughly rinsed in cold water. It is then given a three-minute cyanide copper strike and then rinsed and plated in a nickel solution for thirty minutes.

After buffing the barrel looks perfect, but when it is taken out to the customer and used at the soda fountain for a few days the peeling starts.

A.—Analysis of your solution is:

Nickel	1.95 oz.
Chloride, as ammonium chloride	5.04 oz.
Ammonium hydroxide	11.34 c. c.

Solution is high in chloride and alkaline content. Add 2 c. c. sulphuric acid to each gallon of solution and do not add any more chloride for quite some time.

Your method of cleaning and copper striking is correct.

—Oliver J. Sizelove.

British Progress in Electroplating in 1928

Expansion of the Industry; Bright Prospects Are Ahead—Conclusion*

By S. WERNICK

Honorary Secretary, Electroplaters' and Depositors' Technical Society

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

THE "ESTABLISHED" FINISHES—NICKEL PLATING

The development of the newer finishes has by no means been at the expense of the popular and ubiquitous older finishes, among which nickel-plating, of course, has prime place. On the contrary, so far as this country is concerned, and no doubt the same has been experienced in America, nickel-plating has been adopted on an ever increasing scale. The newer finishes have, if anything, acted as a very effective means of advertising the other wares in the electroplaters' window, which have the material advantages of being firmly established and well-tried.

The further important factors which have helped the spread of nickel plating are, first, the reduction in costs which has been rendered possible by the wider adoption of the newer plating technique, which has increased the C.D. possible by the use of agitated, filtered and heated nickel solutions, and also reduced the handling operation to a minimum of the use of automatic conveying plant. Secondly, there has been in general a marked improvement in the quality of the deposit. We are slowly but surely reaching the stage when the nickel deposit, intended for the double object of protecting the base metal as well as the enchancement of its appearance, which is less than one mil in thickness, will be unknown.

This has been the inevitable reaction to the popular cry against inefficient nickel-plating, of which it must be conceded a by no means inconsiderable amount was in evidence (in every sense of that word) some two or three years ago. The unfavorable comment of the semi-technical and even lay press on the subject, backed up by the evidence disclosed by the porosity tests devised by the technical worker, resulted in the realization that the hope of re-popularizing nickel-plating lay in the adoption of the one-mil deposit. In regard to porosity and pitting some of the factors with which these and allied defects are bound up have recently been elucidated,[1] and being now more widely realized by platers, appropriate action may be expected to produce even better results.

ZINC

Zinc plating is another finish which is now, somewhat belatedly, receiving the recognition which it has long deserved. With the exception of one other metal, which is far less common and therefore far more costly, it is the best rust preventative which the plating industry has to offer.

Zinc has, of course, been applied in several other ways, the oldest being by galvanizing, or hot dipping, but it is significant to note that all the newer methods of its application—sherardizing or vaporizing; spraying, or impingement of the molten metal upon the surface by gas pressure—are enjoying a vogue at present. Each of the methods of applying a zinc coating has its special advantages, but those which zinc plating has to offer are at least as important, and in some respects more valuable than the rest.

To cite a few of the advantages briefly[2]: The electrodeposit is more regular; the thickness controllable to very fine limits; an exceptionally thin deposit possible as compared with other processes; the articles coated are not subjected to relatively high temperatures; while, most important of all, the structure and composition of the deposit are particularly suitable for a coating possessing a high protective capacity.

COPPER

Copper plating, the manifold uses of which, in the fields of metal decoration as well as its well-known applications in special industries, have always been on a large scale, is finding increasing use owing to the flourishing condition of some of these industries. Among them, that of the production of gramophone matrices calls for special mention owing to he remarkable recent activity in this industry.

Its use as one of the components in composite nickel plating is also being more widely adopted, and the nickel-copper-nickel—or "three-ply"—process, so popular in the States, is being adopted here on an ever-increasing scale. The general consensus of opinion is that this composite deposit yields a higher degree of protection than any other nickel finish.

CHROMIUM

The chromium plating situation has undoubtedly become very much clarified during the past 12 months, both in the direction of an improvement in technique resulting in a really reliable product and a stabilization of the chaotic patent position.

To take the latter first, the chromium plater is not troubled with the uncertain atmosphere which surrounded him a year ago. The efforts of those who appear to have patented every conceivable ingredient that might enter the chromium plating bath, seem to have availed little. Chromium plating is done in this country by a host of private platers, each working his own pet formula, and the system of licensing which appears to obtain to an appreciable extent in the United States is very little in evidence here. It is generally considered that successful chromium plating depends not so much upon the constituents of the solution, provided the now recognized essentials are there, as upon the conditions under which the process is operated.

It is realized now that the commercial application of chromium plating occurred far earlier than was justified by results obtained at the time in the laboratory. In particular, the reaction of chromium plating to time was a completely unknown factor at that period. Chromium plating practice has all along been ahead of theory, but at the time the finish first received commercial application, some of the most important facts which are only now coming to light were then entirely unknown quantities.

We know now that the wonderful appearance of chro-

*Part 1 was published in our January issue.

[1] D. J. Macnaughton and A. W. Hothersall. "The Causes and Prevention of Pitting in Electrodeposited Nickel," Trans. For. Soc., No. 89, 1928.

[2] For a fuller discussion, see "Prevention of Corrosion by Electrodeposition: IV.—A comparison with other metal-coating processes." S. Wernick Industrial Chemist, 181, 1928.

mium plating when it first issues from the bath is likely to deteriorate due to the development of defects of a very serious nature. Some of those have been classified in a paper[3] read some time ago before the Electroplaters' and Depositors' Technical Society, which invoked some very interesting opinions in the course of the subsequent discussion. It was pointed out that the several types of failure of the deposit were largely inherent in the nature of the chromium deposit. Thus, bound up with the extreme hardness are the undesirable properties of brittleness and an internal highly stressed condition of the deposit. Very high C.D.'s undoubtedly accentuate this condition and the desirable lowering of C.D. has been effected in many plants by adjustment of the other plating conditions obtaining.

Again, it has been demonstrated that a great deal of trouble can be avoided by the use of an undercoat of another deposit, the most useful of which has proved to be nickel—this being particularly important in plating upon brass or copper. The strongly corrosive action of the electrolyte renders it necessary to avoid porous material as far as possible as the base metal, effective mopping to "flow" the surface being thus an important preliminary step.

To sum up, chromium plating is entering its appointed sphere, its demerits as well as its special properties are becoming more widely known, the idiosyncracies of the chromium plating bath are being mastered, and, mainly as a result of the continuous research work which has been pursued, there can now be no doubt of its future. The advent of chromium plating bears promise of being of increasing value to the plater as time goes on, provided its limitations are frankly realized.

CADMIUM

Of the "three C's," Chromium, Cadmium and Cobalt, which represent the newer metals with which the plater is concerned, cobalt still remains largely in the laboratory stage, so far as this country is concerned; conceivably, it may find limited application in very special directions, but its cost as compared with nickel is still its greatest handicap. Unlike cadmium (as compared with zinc), its advantages over nickel are not sufficiently compensatory.

The ratio of the cost of cadmium over that of zinc is actually higher than the relative costs of cobalt and nickel, but it is probably not the least testimony to the favor with which its merits as a corrosion preventive are regarded when it is stated that its application commercially has exceeded all expectations. To such an extent is this the case that the boom in cadmium plating is seriously affecting the price of cadmium. The use of cadmium in electrodeposition now represents one of the most important applications of this metal, and this state of affairs discloses the vogue which this rust-preventing finish now enjoys. Its use runs into tons of metal, an illuminating fact when one realizes how many thousands of square feet it is possible to coat with a thickness of a fraction of a mil of cadmium from a single hundredweight of the metal.

Cadmium, of course, has not always been in such favor and adverse reports of its capacity for corosion prevention as compared with zinc have frequently appeared. In the opinion of the author, such apparently incompatible reports have probably had their origin in the nature of the cadmium deposit tested. Although cadium plating does not present the difficulties of chromium plating, it is not sufficiently realized that the deposits obtainable are subject to considerable variation, particularly in regard to the fineness of the grain size, depending on the constituents of the solution and also the conditions of deposition. Deposits with a visible, crystalline structure have been found in the author's experience to give distinctly inferior results as compared with close-grained and apparently "structureless" deposits.

The particular advantages of cadmium over zinc comprise: a closer proximity to iron in the electrochemical series, and, therefore, lower rate of preferential corrosion; a higher electrochemical equivalent, and, therefore, more rapid rate of deposition; a lower chemical reactivity, and, therefore, relative inertness to corrosive influences—in particular to alkalies and certain acids; and the adequate efficiency of a relatively thinner deposit, and its consequent value in precision work.

With regard to its special applications, in such directions, for example as the protection of aluminum and its alloys, and as an undercoat to nickel to render the latter "rust-proof," these are still largely in the experimental stage. The former application shows considerable promise, but the latter has, on the whole, shown somewhat discouraging results. Although the application of nickel upon cadmium is certainly an easier matter than upon zinc, nevertheless, experience has shown that the proximity of the two metals cadmium and nickel is attended by serious consequences, the former being apt to corrode and "bleed" through the surface of the latter, completely spoiling the appearance of the finish. In any case, apart from this surface deterioration, the protection afforded by the cadmium-nickel combination is considerably less than that which cadmium can give when applied alone. On the face of it, however, cadmium-nickel appears to be an ideal combination as a finish and it is possible that further work may reveal a way out of the practical difficulties so far encountered. The finish is understood to be used to a certain extent in France, and also, probably to a more considerable extent, in America, though how satisfactory it has proved is not known. The opinion of one of the best known American technologists in a communication to the author is, however, to the effect that the finish at present leaves much to be desired.

THE WATCH-WORD: RESEARCH

Perhaps the brightest feature of the present distinctly promising state of affairs in the plating industry is the general realization of the value of research into the problems which constantly beset the plater. In this country, the bond between the technologists and chemists in the industry and the practical platers has never been so slose as it is today. The suspicions with which the latter in less enlightened days regarded the former have been dispersed and replaced by complete confidence in the tried and proved ability of the man who wields the test-tube to help his confrere at the vat. On the part of the technical man, too, there is a reciprocated appreciation of, and respect for, the art of the plater, whose constant contact with his solutions apprise him of many things of which the theoretical man may know little or nothing.

So far as this country is concerned, probably no movement has fostered this desirable intimate contact of technologists and platers, by which the wisdom born of practice is blended with the science of theory, as the formation of the Electroplaters' and Depositors' Technical Society. Although established as late as 1925, the beneficent influence of the Society has grown far beyond the expectations of its founders.

CONCLUSION

In conclusion, the verdict which is to be drawn from this necessarily sketchy review is that all signs are set fair for the future of the plating industry. There can be no disputing that 1928 has been a prosperous year. But the signs are that 1929 will eclipse it.

[3] L. Wright, "Deposited Chromium as a Corrosion Preventative," Journ. Electroplaters' and Depositors' Tech. Soc., 25, 3, 1928.

The Barrel Burnishing of Metal Products

An Analysis of Burnishing and Tumbling Metal Pieces in Barrels

By H. LEROY BEAVER
Philadelphia, Pa.

FROM A PAPER READ AT THE ANNUAL BANQUET OF THE PHILADELPHIA BRANCH, AMERICAN ELECTROPLATERS' SOCIETY, NOVEMBER 24, 1928

HISTORY

THE barrel method of finishing metal products and which is variously termed as rumbling, tumbling, tubbing and burnishing, undoubtedly originated in England about the year 1900. As near as can be learned, the originator of the process was a man named Edmunds. The moving thought in his conception of the method is interesting and the story is that, in observing the operation of a revolving cylindrical screen at a trap rock quarry, he was impressed with the brightly polished wire screen on the inner side of the drum, and he probably reasoned that, if a screen could be brightly polished of itself, why would not metallic articles when placed in a cylinder together with some suitable material and revolved, also take on a bright finish equal to that produced on the inner or contact surface of the revolving screen drum?

H. Leroy Beaver

Edmunds

There is some slight conflict as to the approximate date of the first use of a barrel for this purpose in the United States. Undoubtedly, imported barrels of the Edmunds type were the first, and these were of the oscillating type. The earliest record of the Edmunds barrel in the United States comes from the Improved Seamless Wire Company, Providence, R. I. This company, in July, 1903, purchased eight Edmunds burnishing machines in Birmingham, England. The first two of these machines were received in this country in September, 1903. They were immediately set up on the floor of the United Wire and Supply Company, also of Providence, R. I.. where prospective users were invited to bring sample parts for demonstration.

Barton

Our next reference brings us to the Barton brothers, Harvey and Everett. Early in 1904 they produced a two-cylinder barrel of the type now largely used in the jewelry trade and known as a tubbing machine for the reason that the soapy water, used as a lubricant in the process, was carried in an outer tub, while the barrel revolving within the tub was perforated to permit of easy ingress and egress of the soapy water. The barrels of this machine were corrugated on the inner sides to provide for break-up or churning of the mass within the barrel when in operation. This type of barrel was the forerunner of the present day Smith-Richardson tubbing machine.

Baird

The next barrel development came about the year 1907, when the Warner brothers, Charles L. and Burton, originated what is now very generally known as the Baird Burnishing Machine.

Abbott

George E. Abbott, after considerable experimental work, developed three different barrels. The first two, after exhaustive tests, were discarded. The final type, which is exemplified in the present day Abbott Burnishing Barrel, was perfected in the year 1910, and is substantially the same as the present Abbott Barrel.

Aside from the above, and they may all be recognized at least in a large sense as having contributed materially in the development of the art in this country, there were and are smaller producers of burnishing barrels, all of them following in some degree the leads supplied by the above who are the real pioneers in the practice of the art.

In all of the above barrels speeds of from 30 r. p. m. to 60 r. p. m. were variously recommended. They are in every sense, with the possible exception of the Baird Machine, tumbling barrels in the generally understood acceptance of that term. Inasmuch as we are not at this time concerned with grinding or cutting down processes, we will not dwell on the various types of barrels generally used for that work. There is, however, a very clear distinction to be drawn between cutting down, tumbling and burnishing.

The practice most widely adopted in our various fields of production of metal products is the tumbling method, which is an intermediate method between the initial grinding and the final burnishing. For this work either a wood barrel or a cast iron barrel lined with wood, preferably hard maple, is used. The general practice has been to use round balls for the burnishing mass, and the story of the adoption of balls is also interesting, due to the fact that it goes back to Edmunds and the first known tumbling barrel. We are told that, in seeking for some suitable material for carrying out his process which would have the greatest element of permanency and which could be used over and over again, he hit upon reject steel bearing balls or cycle balls as they were termed at that time. The Hoffman Manufacturing Company, of Chelmsford, England, were, at that time, the world's largest producers of round steel balls. It was from this source that the first steel burnishing balls came and the reason for their use, undoubtedly, was due to the fact that they were the most readily available form of material that offered the permanency he sought. The use of round steel balls has been followed down through the years with only sporadic attempts to originate any new and more efficient burnishing mediums until about three years ago.

In a previous discussion of this subject and of the most efficient mediums for carrying out the process, the point was advanced that neither in theory nor in practice could any round ball be forced into an angle or into a groove smaller than its own diameter and that something more was required to satisfactorily complete the process in which the round balls could only perform a certain part.

That the thought of some other form of material is not new is evidenced by the efforts of Wenger, England, 1912, and later of Thomas DeVilbiss, United States, 1915, followed by Abbott and later more thoroughly and comprehensively brought out by Beaver.

If it is true that a perfect sphere offers the least resistance of any solid body, then it must be equally true that aside from its sphericity, such a sphere cannot be the most effective medium for burnishing work, because we require a material offering greater, rather than less, resistance.

A very simple test can be made of the theory by plunging your hand first into a barrel of round balls and then into a barrel of mixed materials composed of balcones, diagonals and finbals. You will immediately sense the greater resistance of the irregular forms as compared with balls only, and so in addition to their greater value in reaching irregular angles and grooves of the parts to be burnished, they also provide a materially greater resistance to the parts passing through the burnishing mass, hence more thorough and faster work.

A careful digest of practically all the available literature on the subject, consisting of articles in the trade press, catalogs, pamphlets, advertisements, etc., discloses no conception of operation of the process other than to use two parts of burnishing materials to one part of work to be burnished, cover the entire mass of burnishing material and work with water, throw in a handful or more of soap and proceed. Now it must be obvious that no such hard and fast rule can be laid down. While it is true that there are many kinds of products where the above rule will apply, it is equally true that there are as many more where it will not. We have in mind a maker of candlesticks and if he were to adopt this theory of two pails of burnishing material to one pail of candlesticks, we need hardly comment on the disastrous results, and especially if the barrels were operated at a speed of from 30 r.p.m. to 60 r.p.m.

In all of the available material examined in the course of preparation of this paper, there is no record of any maker of burnishing barrels ever advancing the theory that an operation fully equivalent to buffing can be as well accomplished by the barrel method as by handling the articles against a buff wheel. Let us examine this phase of the subject briefly. In buffing with a wheel, a fine abrasive polishing agent is applied to the buff, and the articles to be burnished are in turn presented against the buff where by the rapid revolution of the buff, carrying its polishing medium, a high lustre is produced wherein a small part at least of the surface is carried away so as to reduce the range of the high lights to the equivalent range of the low lights or background, and in this manner to produce a surface area where the light rays are more evenly refracted. In other words, to produce a polished or burnished surface.

Now suppose we take the conventional metallic burnishing material mass, adding the customary soap and water, but advancing further than this we add a quantity of the abrasive polishing medium identical with that used on the buff, and this should be what we might term a soft polishing abrasive as distinguished from a hard or cutting abrasive, such as vienna lime, or any one of several other materials of like characteristics and which would then be carried in suspension within the polishing mass. In operating the barrel all of the elements of pressure are present that can be found in a hand buffing operation against a wheel except that the pressure is more evenly distributed and is more constant in degree. Less material will be required to be removed by the metallic mass in conjunction with the polishing abrasive because in addition to the operation of the abrasive burnishing compound acting in conjunction with the burnishing mass itself, we have a constant rolling or rubbing pressure equal from every angle due to the complete immersion of the parts within the burnishing mass. This rolling rubbing pressure having a great tendency to equalize the surface area by pressure rather than by removal of any part of the surface of the materials being burnished. Generally speaking, by the adoption of a slower barrel speed we can accomplish by pressure from within the mass all or substantially all that might be accomplished by the buffing method, but with the removal of less surface, which naturally tends to longer life of the plated surface. Instead of removing any appreciable part of the plate, by this method we roll the plate to an even denser degree upon the base metal.

Some of the early articles published on the subject, when considered in the light of what we have later learned, are interesting, as the following extracts indicate:

Brass World—October, 1906

"Operate the barrel at 50 r.p.m. Although the polishing action will take place if only a few balls are used, it is false economy to use too small a number. It matters not what the shape of the barrel is, although a hexagon barrel is better suited to stir up the work."

Brass World—March, 1909

"In using steel balls for burnishing, all that is necessary to do is to have a suitable tumbling barrel (a horizontal one is required) and to place the work to be tumbled in the barrel with a sufficient number of balls. The less balls there are the longer the polishing will take, so that it is poor judgment to attempt to economize on balls."

American Machinist—April, 1910

"The process consists in placing the work in a tumbling barrel, preferably of wood and of the horizontal type, so as to prevent scratching of the work against the sides of the barrel, and then dumping into the barrel a large quantity of small steel balls measuring in bulk about twice that of the work to be burnished together with a soap mixture, in which the work and the balls are confined or held together so that as the barrel rotates, the whole mass of soap, work and balls is tumbled about, causing the balls to be forced in all directions across all of the work surfaces, thus giving a constant burnishing action. The process takes the place of buffing both before and after plating on such articles as electrical goods, chains, buttons, thimbles, typewriter parts and other parts.

"Naturally, when we consider using, say a couple of pecks of balls for the burnishing of thimbles or other small parts a peck at a time, the question of expense will come to mind instantly and lead us to wonder how the process can be an economical one even though the balls are used over and over again."

BARREL BURNING DEFINED

Barrel burnishing is a process for polishing metal products either plain or variously plated and to produce either a smooth surface prior to plating or a brilliant finish after plating. The process simply described consists of subjecting the article to be burnished to rotation within a burnishing medium and producing this rotation while the article is suspended in the burnishing medium.

This means the article to be burnished is actually rotated within the burnishing mass, while suspended in that mass, that is to say, that it is not substantially displaced radially from approximately the central position. In other words, the articles are rotated while continuously held approximately central of the mass, and excludes a condition where the articles pass into and out of the mass, that is, where the articles being burnished are sometimes within and sometimes without the mass.

This article will be continued in an early issue.—Ed.

What the Brass Foundry Needs

A Message on Foundry Costs

By WILLIAM H. BARR
President, William H. Barr, Inc., Buffalo, N. Y.

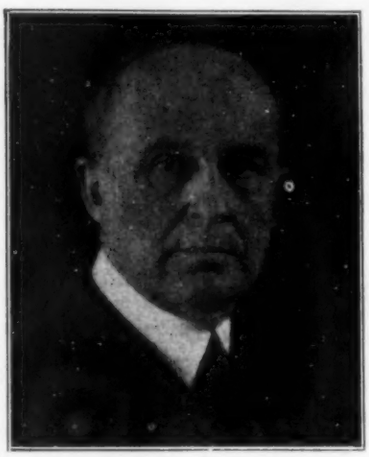
WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Mr. Barr is known to foundrymen all over the United States. He was for a number of years President of the Lumen Bearing Company, Buffalo, N. Y., and also President of the National Founders' Association. This Association is one of our oldest and most prominent trade bodies, representing foundries casting iron as well as all other metals.—Ed.

FROM time to time we hear discussions which indicate that the brass and bronze casting industry is suffering from an inferiority complex.

However, from a careful analysis of conditions it appears that the industry has held its own remarkably well during the past few years, when buying in many branches of the metal trades was at a low ebb.

The basic factors which govern our industry point to a future which offers stimulating and interesting opportunities for definite trade expansion and particularly for those foundrymen and metallurgists who are alive to its requirements and possibilities.



William H. Barr

It must be conceded, for example, that the position of the industry is greatly strengthened by the fact that in spite of costly experiments it has not so far been possible successfully to substitute other materials for non-ferrous castings in the majority of their uses. Our industry is not suffering greatly from the inroads made by competitive materials of various kinds, which have added to the many problems of the iron foundryman today.

True, the competition of roller bearing manufacturers curtailed bronze casting production in the field of bushings and bearings of similar type, to some extent, but the many new uses for non-ferrous products which have been developed in a number of fields serve to offset this deflection.

While a comprehensive discussion concerning many of the problems of the brass founder cannot be undertaken here, the adoption of more effective business methods and practices would help considerably in stabilizing our industry. Many of our troubles result from two outstanding abuses of good business practice, the correction of which would raise the level of the trade.

The first is the time-worn subject of inaccurate cost methods, or lack of any cost method whatever, due to which many foundrymen bid blindly without regard to the proper distribution of shop burden, to say nothing of earning a reasonable profit. We all know that in the past, and too frequently in the present, many foundrymen, because of the lack of an adequate cost system, travel along in the dark, unnecessarily operating in red, with resulting loss to themselves and with harm to the entire industry.

Fortunately, there seems now to be a tendency to correct this situation as a result of efforts being made by many brass foundrymen of good reputation to install sound cost systems under experienced men. As an immediate result, they decline to make castings which do not yield a profit. This will result, of course, in unprofitable business going to the unwary foundrymen who continue to work in the dark.

The manifest conclusion is that everything possible should be done to stimulate the application of sound cost systems by trade magazines, such as THE METAL INDUSTRY, and through ever other available channel.

The second point is a responsibility of the foundry management, which too often permits customers to supply inferior pattern equipment, thereby cutting down the rate of casting production, with serious loss to the foundry, as well as delay in delivery of the castings. On the other hand, many brass foundrymen continue to use improperly rigged patterns, without bringing to the attention of the customer the fact that proper pattern equipment would enable them to reduce the price of the castings, with profit to both.

The obvious conclusion is that unless some of the smaller brass foundries, who, through lack of business experience, are as a rule the worst offenders, give more attention to some of these fundamental errors, they will be automatically eliminated from the industry, and without credit to themselves.

A little intelligent co-operation among the brass founders might be mutually beneficial, and help to place the industry on the basis to which it is rightfully entitled and should enjoy.

Black Finish for Dials

Q.—We are sending you some dials. We would like to know how the black lines and figures on these are produced. One of the samples has a frosted silver finish. Do you know how this is applied?

A.—The sample dial was finished by the following method:

After the dials are etched and before the resist has been removed, they are immersed in the following solution until the black is produced:

Carbonate copper	16 ozs.
Ammonium hydroxide	64 ozs.
Water	1 gal.

The water is added after the ammonium hydroxide and copper carbonate has been thoroughly mixed. The solution is used at a temperature of 175° F. There must be an excess of carbonate of copper present at all times or results will be poor. After the black has been produced, remove the resist and plate in a silver solution that has a low free cyanide content; scratch brush lightly; coat with clear silver lacquer. —OLIVER J. SIZELOVE.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Editorial

Uniform Cost Methods

STEADILY, and we hope rapidly, realization is coming over the foundry industry that its most important evil must be cured, by co-operation and concerted action. This evil, inaccurate and unintelligent price quotations, is pointed out in the message to brass foundries by W. H. Barr, published on page 86 of this issue. Mr. Barr recommends co-operative action. So also did John L. Carter in a paper read before a recent meeting of the National Founders' Association, in which he pointed out the advantages of a uniform cost system in local groups of foundries.

There are two kinds of price-cutting, unintentional and intentional. Both are equally unintelligent. It is safe to say, however, that the unintentional price-cutting is by far the most dangerous because it knows not where to stop. A man who goes out to get a job with the definite purpose of quoting low, but knowing his costs, will think very hard before he quotes below actual cost, no matter how badly he wants the work. It is the man who does not know his costs, who forgets overhead and depreciation, who quotes utterly ridiculous figures and gets work which lands him in bankruptcy, and keeps his competitors out of profitable business. There is no cure for the man who, knowing his costs, deliberately quotes below them. He is his own executioner. But he is rare enough not to be an important factor in business. There is a cure, however, for the price-cutting of ignorance, and that is education.

How can this education be given? The foundry trade should realize that it is to the interest of the trade as a whole to educate its illiterate members. To be sure costs vary in different parts of the country, but a large proportion of foundry business is fairly local in character, hence the practicability of local groups of foundries co-operating to help uniform cost systems, which will permit price differences only as a result of real economies in production methods or overhead. There will always be differences in prices, even between two foundries next door to each other. This is as it should be, but these differences should be reasonable and logical.

The paper by Mr. Carter mentioned above, described the formation of a number of local cost groups, one in Newark, N. J. This one has been operating for five years; it is no longer an experiment, but a successful institution. The original group of six co-operating foundries has grown to twelve. They have, they admit, a better cost system than they had before, and conditions in the district have been markedly improved. A clear example illustrates the point better than endless discussion. A cost problem was sent out to 25 foundries, which returned estimates varying from five to fifteen cents per pound. Another problem sent out to the uniform cost group resulted in answers varying only ¾ of a cent per pound. Nothing could be clearer.

Work of this sort is not price-fixing or illegal restraint of trade. Comparisons are not made before quotations are submitted. It is simply intelligent and understanding arithmetic which takes into consideration all the factors of cost.

Where a national cost system might fail in the foundry industry particularly, local cost groups have possibilities of inestimable importance.

The Building Trades

THE annual forecasts have appeared for the building trades, and this trade is so important a consumer of metals, that it justifies a special review. The Copper and Brass Research Association has compiled statistics which lead them to estimate that approximately $8,500,000,000 will be expended for new construction, repairs and replacements. This total exceeds the expenditure for 1928 by about $500,000,000. If this is really achieved, it will establish a new record for all time.

An analysis of this estimate shows that $500,000,000 are provided for replacement due to fire and storm losses; housings to care for normal population increase, $1,533,000,000; other construction necessary to accommodate this increase in population, $1,227,000,000; replacements for obsolescent and depreciated buildings, figured on a life of sixty years for present buildings, $2,122,000,000; maintenance, alterations, repairs, etc., $1,242,000,000. Other items of various sorts are added to bring the total up to the $8,500,000,000.

The Architectural Forum in its eighth annual survey estimates total construction for 1929 of about $7,300,000,000, exclusive of public work and utilities. This figure is not really comparable with the statistics of the Copper and Brass Research Association, as it has definitely excluded certain factors. However, the important point in the Forum's survey is the conclusion that the last few years of great building activity did not represent a boom period, but that the United States and the building industry had arrived at a relatively new standard for its growing population, a desire for better housings and better building in commerce and industry and the ability to pay for these facilities. Consequently 1928 was 5 per cent ahead of 1927 and 4 per cent ahead of 1926 for total construction, including engineering, public works and utilities. In fact, the Forum goes so far as to say, ". . . . it becomes quite evident that we are building well over $8,000,000,000 worth of new construction annually, and that the probable total expenditure in every phase of the building industry is perhaps $10,000,000,000!"

One thing seems to be certain from all these figures. Given an opportunity to borrow money on mortgage at a reasonable rate, building should not take a sudden slump, leaving its source of supply high and dry. This market for hundreds of millions of pounds of copper, brass and plated products will not fall away as many have had reason

to fear. It will have its better years and its worse years, but it seems to be the consensus of authoritative opinion that building has been stabilized at a very high level.

Work Ahead in Metals

FROM time to time, we hear the old cry, "There is nothing left to do. My field has been explored and there is no longer any unknown in the field of metals. Brass is an old story, bronze has its limitations, aluminum is thoroughly familiar to us; even in melting, we have gone the limit with electric furnaces."

This point of view is so fallacious, so utterly wrong-minded that it would be irritating if it did not give us an opportunity to do something which is always a pleasure—that is, to lay out work for others to do. A short time ago, Roger Babson listed seventy "big opportunities" for becoming a millionaire. We have neither the space nor the time to list seventy, but we point out the following openings for research, which if successful, would amply repay any expenditures which might have to be made on them.

1. A process for casting brass under pressure in steel molds, similar to die casting, as it is carried on today.
2. A permanent and trustworthy aluminum solder.
3. The production of aluminum from common clay.
4. A good all around substitute for platinum in industry and laboratory work.
5. A self-lubricating bearing.

These are broad general problems, large enough in scope to daunt any but the most fearless. However, there are many others, narrower in scope, which should tempt the adventurous. Consider for example, the large number of studies possible in the field of corrosion prevention, atmospheric and by various chemicals; the development of certain fluxes and metal cleaners to eliminate impurities and gases; the production of solid non-porous die castings; the development of a chromium solution with good throwing power.

We have done our share, having pointed out to others what they should do. As Mark Twain said, "To be good is noble, but to teach others to be good is nobler—and less trouble." To lay out work for others is certainly less trouble than doing it oneself, but it has the saving grace that it may correct unfortunate misconceptions in the minds of others who are unduly discouraged.

Proper Purchasing

THE purchasing agent or buyer is one of the few who are in a position, worse, if possible, than the umpire in a baseball game. He has the power over the salesman to make or break business. He can release or hold up requisitions from the plant, seemingly at will. His general attitude seems, to the outsider to be one of "lordly surveying."

The truth is, however, that it is not all so rosy. The purchasing agent is accused of every crime on the calendar. The salesman who finds him too busy for an interview, accuses him of conceit. The salesman who cannot sell him vows that his competitors have bribed him. The department foreman who is waiting for materials, accuses him of laziness. The polisher or plater who wants a specific type of material and no other, swears that the purchasing agent buys only at bankruptcy sales of spoiled materials. That is the other side of the picture.

Proper purchasing calls for skill, tact, ingenuity and judgment. The factory has the right to specify the materials it wants. The purchasing agent can buy such materials at the best possible price, or materials of equal grade if he can get them more cheaply. In so doing, however, he must be careful that he does not unload onto the factory a cheaper substitute. The purchasing agent has a right to shop for the best possible price, but it is both unethical and bad tactics for him to quote fictitious prices to competing salesmen to bring the figure down to a point where the firm that gets the business loses money. A good purchasing agent knows that the price is only one item in the total cost. Other items are quality, deliveries, dependability—in other words, "service."

An interesting recommendation is made by M. Q. Macdonald, in an article which appeared in "Purchaser," the official organ of the National Association of Purchasing Agents, to remedy graft in purchasing. The subject is a sore one and extremely difficult to handle because the offense is so great that accusations must be made with care, and detection is extremely difficult. He suggests that where the purchasing agent knows of a concern which makes a practice of bribery to get business, he refuse absolutely to do business with that concern. It is a good suggestion. A few reprisals of this sort will stop any firm from attempting bribery again. The weak spot is the pocketbook and a few blows at that point will be the strongest deterrent to any evil-doer.

Some concerns have tried ways and means to keep their employees from being approached indirectly. One large automobile company, for example, sent out notices last November, requesting its officers and employees to refrain from accepting presents from firms and individuals with whom they had business relations. It would be interesting to know just what results they obtained from its move.

The purchasing department is one of the delicate spots of any business organization. It can be a source of great savings if properly handled. It can be the cause of great wastes in the hands of the wrong person. It is a pertinent fact that the capable purchasing agent and the capable salesman are almost always the best of friends.

Jesse L. Jones

THE announcement of the death of Jesse L. Jones, published elsewhere in this issue, will be read with sorrow by thousands of foundrymen and metallurgists throughout the United States.

Mr. Jones was a pioneer in the technical control of brass foundries. He was one of the few who, in the early days showed practical foundrymen how the chemist and metallurgist could be of practical assistance. He was not a "high-brow." He understood thoroughly the need for translating science and technology into simple English for the foundryman to use in his daily work. He was a scientist, but not of the type that "tells others things they already know in language that they cannot understand." He was thoroughly practical in the sense that he showed the foundryman how to use the findings of the abstract scientist.

Mr. Jones' personality made him a valued friend and co-worker. He was respected for his ability and knowledge, and loved for his sincerity and sympathetic understanding of other men.

The metal industries join with his family in mourning him, as they also have lost a noble friend.

Correspondence and Discussion

Patents on Chromium Plating

To the Editor of THE METAL INDUSTRY:

The research described in our Technologic Paper No. 346 represents a survey of the various factors involved in chromium plating in order to determine what conditions are most favorable for producing any given type of deposit. In making this study all available facts and information were considered, regardless of whether they had or had not been referred to in previous publications or patents.

No patents upon chromium plating have been taken out by the Bureau of Standards or any of its staff.

While occasional references have been made in published articles to the question as to whether methods described in Bureau of Standards publications were covered by patents, we have never been formally advised that any such publications constitute an infringement.

As the subject of patents is outside of the field of this Bureau, we are not in a position to express any opinion regarding the validity or scope of any patents on chromium plating, or whether any given processes are covered by valid patents. Such matters rest entirely with the Patent Office and the courts.

Washington, D. C.
January 24, 1929.

GEORGE K. BURGESS, Director,
Bureau of Standards.

Technical Papers

Seamless Tubing, a Bibliography, by Victor S. Polansky. This list includes material published up to the end of 1926 on seamless tubing of all sorts; also patents.

Standards of the Hydraulic Society. The Hydraulic Society, 90 West Street, New York City. Price, 50 cents. Technical, engineering and commercial data on displacement and centrifugal pumps, including definitions of terminology, outline of trade practices, etc. An 80-page booklet, well printed and illustrated, which should be of great value to pump users and builders.

The Surface Tension of Molten Metals, by Earl E. Libman. Bulletin No. 187. Engineering Experiment Station. University of Illinois, Urbana, Ill. Price 15 cents.

This is part 2, on the determination of the capillary constant of silver. The author defines surface tension, points out the importance of such data for metals, describes the experimental methods used, gives a table of actual film measurements and plots the capillary constant of silver against the temperature.

Abstracts of Scientific and Technical Publications. The Massachusetts Institute of Technology. Published by The Technology Press, Cambridge, Mass. No. 1, 88 pages; No. 2, 72 pages.

These booklets cover all the technical papers, including doctors' theses, issued at the Institute since January, 1927. All publications are given in abstract, from which particular papers desired can be chosen. Valuable for reference work in all branches of science and industry.

Trade Standards Adopted by the Compressed Air Society. The Compressed Air Society, 90 West Street, New York City. Price, 50 cents. The third edition of a pamphlet covering results of research by the members of the Society. Embraces accepted terminology concerning air compressors and operation; history of development of speeds of air compressors; explanation of capacities and pressures; the low pressure nozzle test recommended by the Society; installation and care of compressors; tables of various figures, illustrations, etc.; and a list of applications of compressors.

Zinc and Its Corrosion Resistance, published by the American Zinc Institute, New York. Price $1.00.

This booklet presents in abstract form, existing data concerning studies, investigations, tests, equipment and researches in this practical field of the use of zinc. It was prepared by the Research Service, Inc., under the direction of the Development of Industry Committee of the American Zinc Institute, to make available a resume and biography of the published material on the subject.

With the permission of the National Research Council, the Section, "Corrosion of Zinc" of the Research Information Service on "Corrosion of Metals," issued in mimeographed form by that Council, has been used as the basis of the publication. The action is given of various chemicals on zinc; different types of waters; some factors which influence the corrosion of zinc; general corrosion topics and miscellaneous subjects which include zinc coating methods, etc.

Physical Properties of Dental Materials (Gold Alloys and Accessory Materials) by R. L. Colman. Bureau of Standards Journal of Research, December, 1928.

The physical properties of dental gold alloys used in the wrought and cast states, investments, and pattern waxes were investigated. Practicable methods of testing these materials were developed, and these methods and the apparatus used are described. The properties of a large number of representative commercial materials were determined and the values reported. Especial attention was given to those properties having a direct bearing on the usefulness of these materials in the construction of mechanical dental appliances and to the effects of variations in manipulative procedures. Improvements in methods of manipulation, especially in the dental-casting processes and in the heat treatment of gold alloys, were developed. It was found that the dental gold alloys on the market vary widely in their mechanical properties and fusion temperatures as well as in chemical composition. This emphasizes the necessity for selecting suitable materials for specific purposes on the basis of tests of physical properties. The methods of testing developed and described herein provide the dental profession and schools with a means of grading and selecting materials on this basis.

Wear and Mechanical Properties of Railroad Bearing Bronzes at Different Temperatures. By H. J. French, S. J. Rosenberg, W. LeC. Harbaugh and H. C. Cross. Research Paper No. 13. Bureau of Standards. Price, 35 cents. Obtainable from Superintendent of Documents, Government Printing Office, Washington, D. C.

A study was made of the wearing and mechanical properties of two groups of copper-tin-lead alloys in both chill-cast and sand-cast conditions. The bronzes were tested under rolling and sliding friction without lubrication at atmospheric and elevated temperatures up to 350° F. (175° C.), under both sliding and rolling and sliding friction with lubrication at atmospheric temperatures, and under tension, impact, and pounding at temperatures from 70 to 600° F. (20 to 315° C.). A detailed description is given of all apparatus used in the tests.

No one of the selected laboratory tests yielded information which by itself was adequate for general comparisons.

Variations in chemical composition of the bronzes produced major changes in properties, but within certain ranges variations in chemcal composition were much less important than variations in the method of casting.

Generally, chill-cast bronzes were less resistant to wear and impact than sand-cast bronzes, but were more resistant to pounding and tension.

Increase in lead, particularly in the range of 0.25 to 10 per cent, improved wearing properties but lowered resistance to pounding, impact and tension. Increase in tin improved all properties. Increase in temperature of test generally decreased resistance to tension, impact, pounding, and wear, the changes being most marked from 350 to 600° F. (175 to 315° C.).

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS { WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; P. W. BLAIR, Mechanical; CHARLES H. PROCTOR, Plating; OLIVER J. SIZELOVE, Chemical

Bright Dipping Brass

Q.—In bright dipping parts made from either cast brass or rolled brass, we get white deposits on the surface. The dipping solution used is one part commercial sulphuric acid and two parts commercial nitric acid.

Could you recommend anything to neutralize and remove this deposit, or would you recommend another bright dip solution?

A.—The usual method of preparing a bright dip is to use 2 parts of sulphuric acid to 1 part of nitric acid, with the addition of 1 oz. of muriatic acid to each 10 gallons of the bright dip. It will also be found that a certain amount of water must be added to a new bright dip before the work will dip bright. Be sure that the dip is operated cold. Try this mixture of the acid instead of the one you are using and if white spots still appear, look for impurities in the sulphuric acid such as arsenic or sulphites. The metal may also contain impurities such as lead or arsenic which may be the cause of the trouble. Leaded brass will never dip bright. If you had sent a sample of the work being done, with the spots that you mention, the trouble would be easier to locate and we could advise accordngly.

—O. J. S., Problem 3,812.

Cadmium Solution

Q.—Please give me a formula for a cadmium solution and approximate cost of such solution.

A.—Formula for cadmium solution:

Sodium cyanide	9 ozs.
Cadmium oxide	2 ozs.
Caustic soda	2 ozs.
Water	1 gallon

Use 2 grams mercury cyanide per gallon of solution as a brightener. Temperature, 130° F.; 25 amperes per square foot. The cost of the solution will be approximately 35 cents per gallon.

—O. J. S., Problem 3,813.

Chromium Patents

Q.—We would like to know if there is any danger of us getting into any legal difficulties or patent litigation over using any of chromium formulae you supply in answer to questions?

We would like to do general job work in chromium plating.

Q.—The chromium plating formula prescribed by us and at present operated in a hundred plating plants in this country are purely commercial and are covered by no existing patents. The basis of such formulae is as advocated first by Carveth and Curry in 1905, chromic acid and sulphuric acid, and by Sargent, who completed his investigations a number of years previous to the publication of them in 1920. Sargent's solution consisted of chromic acid and chromic sulphate. Both types of solution give identically the same results under commercial practical operations. The writer discovered that a natural chromate of iron, consisting essentially of chromium and magnesium, improved both the Carveth and Curry solutions, as well as Sargent's. No mention was ever made in any patent literature of the addition of natural chromate of iron, as outlined, to a chromic acid solution containing sulphuric acid or chromic sulphate. Hence, the solution is distinctive and is commercial. The maximum proportions advocated in Mr. Proctor's solutions are:

Water	1 gallon
Chromic acid	48 ozs.
Natural chromate of iron	1½ ozs.
Sulphuric acid, 60 deg.	½ oz.

The minimum solution especially adapted for chromium plating high carbon steel tools, dies, etc., and for direct plating upon brass is:

Water	1 gallon
Chromic Acid	8 ozs.
Natural chromate of iron	¼ oz.
Sulphuric acid 60 deg.	1/12 oz.

The operating conditions are as previously outlined. Anodes used are soft sheet steel not less than ⅛ inch thick and a maximum of 4 inches wide, with length in proportion to the depth of the plating tank. The proportions of a chromium plating solution may be varied upon exactly the same composition basis, with a range of from 48 ounces 32-24-16 and 8 ounces of chromic acid, the natural chromate of iron proportionately, as well as the free sulphuric acid. The additions of sulphuric acid per working day per gallon of solution may vary from 1/60 oz. for the minimum solution and 1/30 oz. for the maximum on 48 ounces solution; that is, under continuous working conditions. Anodes of sheet lead equaling 10% of the total anode surface, consisting, then, of soft sheet steel 90% and sheet lead 10%, give the maximum anode control of these solutions.

The voltage is low 6 volts for the maximum solution and 3½ to 4 volts for the minimum.

—C. H. P., Problem 3,814.

Cleaning and Coloring Steel

Q.—Is there a preparation, to be used cold, that removes rust from polished steel without discoloring the metal? Possibly a hot solution could do the trick.

Is there any way of staining polished steel into various colors through a non-electrolytic process. I would appreciate greatly any data on these subjects.

A.—The only method that I am familiar with to remove rust from polished steel is by the use of muriatic acid, either hot or cold. If the work is not too badly rusted, the hot muriatic acid pickle will not discolor the metal.

Various colors can be produced on all metals in the following solution:

Hyposulphite soda	8 ozs.
Lead acetate	2 ozs.
Water	1 gallon

Use solution at boiling temperature.

—O. J. S., Problem 3,815.

Colored Chrome Finish

Q.—We have heard of a chrome finish in colors on gold; this is the extent of our knowledge. Kindly give full details of this finish if you can.

A.—There is no chemical means that we know whereby different colors can be produced on chromium. When chromium is heated to 400 to 600° F., an oxide of chromium is formed. As the temperature rises above 400° F., very beautiful iridescent colors are produced. At the higher temperature, 600° F., the color is a uniform blue. A little experimenting with the different degrees of temperature will probably produce the finish you desire.

—O. J. S., Problem 3,816.

Oxidizing Brass Plated Die Castings

Q.—Can you furnish me with a formula for oxidizing brass plated die castings? The castings are sand blasted before brass plating and finish must be a dead black with relieved highlights. I am using copper acetate, carbonate of soda and aqua ammonia for oxidizing and have been having considerable trouble getting the proper shade. Some pieces turn different shades, while others get fairly dark. Some, also, get frosty looking. If the castings are left in the oxidizing solution too long the plate is attacked and will not stand up for further operations. Is there a special

formula for brass plating die castings so that oxidizing would be easier to do?

A.—We would suggest that you nickel plate the die cast work before brass plating. This will prevent blistering and will give a better base for the brass deposit. If the brass solution plates a clean uniform color you should have no trouble with the ammonia black finish. However, should you still encounter trouble, we suggest that you use a black nickel solution made as follows:

Double nickel salts	8 ozs.
Zinc sulphate	1 oz.
Sodium sulphocyanide	2 ozs.
Water	1 gallon

Use 1 volt pressure and room temperature.

—O. J. S., Problem 3,817.

Plating Die Castings

Q.—Please tell me how to nickel plate and silver plate die castings of zinc alloy. I want to give them a quick bright plate. What are the best solutions for cleaning the castings before plating? I have used sodium citrate solution before nickel plating but dark spots appear and edges seem to be burnt. Also, the amperage seems to go down instead of up. How can I raise the amperage?

I would also like to have a good dipping solution for bronzing brass to a port wine color or a lighter color along the same line.

A.—Formula for nickel solution for die cast work:

Double nickel salts	10 ozs.
Sodium chloride	7 ozs.
Boric acid	2 ozs.
Sodium citrate	1 oz.
Water	1 gallon

After cutting down operations, the die cast work should be washed in benzine to remove heavy polishing material. They are then fanned off on a dry wheel, using as little lime composition as possible. Work is then racked, cleaned in a mild alkaline cleaner and plated direct in nickel solution.

For silver finish after work has been nickel plated, strike in silver strike and then in regular silver solution. Scratch brush, using 1 oz. powdered soap bark to 1 gallon of water and a nickel silver scratch brush wheel.

A light brown color can be produced on brass in the following solution:

Hyposulphite soda	8 ozs.
Nickel sulphate	2 ozs.
Copper sulphate	4 ozs.
Water	1 gallon

Use boiling hot. Immerse work until a smut is produced. Scratch brush dry.

—O. J. S., Problem 3,818.

Tinning Copper Parts

Q.—One of our clients who purchases metals from us wishes to have full details on tinning small, copper radio parts. We would appreciate your answering this question.

A.—Briefly, the process is as follows:

Preparation: Cleanse copper parts from grease with hot alkaline cleaners, which come prepared and are advertised in THE METAL INDUSTRY. Wash thoroughly. If copper has been annealed, free scale or oxide must be removed in an acid dip made up of

Water	4 gallons
Muriatic acid	1 gallon

Temperature, 160° F.

Articles should be immersed in this dip for only a few minutes, after which they should be washed in cold water and drained well. If a bright surface is required, the following bright dip should be used next:

Water	1 gallon
Nitric acid, 38°	1 gallon
Sulphuric acid, 66°	1 gallon
Water	1 pint
Muriatic acid	1 oz.

This dip should be prepared a day before using, so that it will be cool. All acid dips and fluxes should be kept in vitrified stoneware or other acid-proof containers.

FLUXING: After cleansing, dipping, etc., articles should immediately be immersed in the tin flux and drained well. To prepare the flux, dissolve in undiluted muriatic acid all the scrap zinc sheet that the acid will dissolve. This will make chloride of zinc. It will be hot immediately after preparing. When cold, filter it through cheese cloth. To each gallon of flux, add one pound of white sal ammoniac and stir in well.

TINNING: Pure Straits tin should be used for perfect bright lustre tinning. Lead is used to lower the cost to some extent. The tin should be melted in an iron kettle and suitably heated with gas or other means to 700° F., approximately; a few degrees higher or lower does not matter. The molten bath should be covered with tallow or, preferably, palm oil to a depth of 1½ inches. Immerse the cleansed and fluxed copper parts in the molten tin for a moment or two, then remove, shake well to remove excess tin clinging to them, cool in high test kerosine, such as Sunoco spirits or paraffine oil, to retain lustre and prevent lumps and adhesion of parts to one another.

DRYING OUT: Rinse in boiling hot water and rumble in hard wood sawdust.

This is the regular tinning process. Retinning is done exactly the same way. Old tin, of course, should be removed completely.

—C. H. P., Problem 3,819.

Verde Green on Copper

Q.—We are sending you a sample of a spun copper shell with a green finish which looks like actual corrosion due to weathering. Can you tell us how to produce this finish? We would like a similar result on brass also.

A.—This is called a verde green finish. For producing it on copper, proceed as follows:

Cleanse the shells and acid dip them or produce a smooth lustre by cutting down with tripoli composition, then cleanse again. Prepare following immersion solution:

Water	1 gallon
Sulphate of copper	4 to 8 ozs.
Potassium chlorate	2 to 4 ozs.

Double nickel salts are sometimes added to this solution in proportions of 2 to 4 ozs. to the gallon. Use the solution at 180° F. Immerse the copper articles and a clay bronze color will result in a few minutes. Remove, wash, dry and immerse in following solution:

Water	1 gallon
Ammonium chloride	3 ozs.

Verdigris (copper acetate) 1½ ozs. Next, immerse in the following solution:

Water	1 gallon
Copper sulphate	4 ozs.
Ammonium chloride	4 ozs.
Calcium chloride	4 ozs.

After this, allow articles to dry out partly and then stipple with a round painter's sash brush to produce the desired mottled tone. The brush may be lightly moistened with either of the last two solutions while stippling.

The following solution is used to produce what is known as Tiffany Green:

Water	1 gallon
Copper sulphate	8 ozs.
Ammonium chloride	8 ozs.
Common salt	4 ozs.
Chloride of zinc	1 oz.
Acetic acid, 28%	2 ozs.

Glycerine is added to the solution to prevent too rapid drying. Other verde green solutions can be obtained by reference to pages 21 and 22 of PLATERS' WRINKLES, issued by THE METAL INDUSTRY.

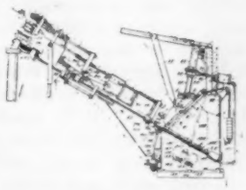
When a verde green finish has been produced, dry the articles and then lacquer the surfaces with a transparent lacquer containing some gums. When the lacquer is dry and hard, brush down either with a soft bristle or a goat's hair wheel, running slowly. A very small amount of beeswax should be used on the wheel. Some operators melt the beeswax with a little chrome green in it to produce a green wax. This produces the eggshell lustre finish.

—C. H. P., Problem 3,820.

Patents

A Review of Current Patents of Interest

1,693,164. November 27, 1928. **Die-Casting Apparatus.** Marc Stern, Flint, Mich., assignor to Doehler Die-Casting Company, a Corporation of New York.



A die casting machine comprising a pressure chamber forming a melting pot for metal to be cast and provided with a nozzle, automatically operated means including a valve device for admitting a fluid under pressure into the pot to eject the molten metal through the nozzle into the die and thereafter automatically to exhaust the pressure fluid from the pot, and a metal-replenishing feed mechanism operating automatically in timed relation to said valve device to feed ingots to the pot at times while the pressure fluid is exhausted therefrom.

1,693,639. December 4, 1928. **Method of Treating Impure Lead and Lead Alloys.** George E. Dalbey, East Berlin, and Thomas P. Hanford, Berlin, Conn., assignors to The Stanley Chemical Company, East Berlin, Conn.

The method of recovering valuable products from impure lead containing tin and antimony, which comprises treating the impure lead with a sodium-antimony salt and causing the antimony in said salt to be reduced to metallic antimony and the tin in the impure lead to replace the antimony in said salt, forming sodium stannate.

1,693,642. December 4, 1928. **Method of Treating Metallic Particles.** George E. Dalbey, East Berlin, and Thomas P. Hanford, Berlin, Conn., assignors to The Stanley Chemical Company, East Berlin, Conn.

The method of treating metallic particles of lead alloys containing one or more of the metals tin, antimony arsenic, which comprises subjecting the particles, at temperatures substantially below the fusing point thereof, to the influence of a water solution of an alkali metal in the presence of an oxiding agent.

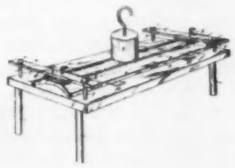
1,694,791-2. December 11, 1928. **Induction Electric Furnace.** Edwin F. Northrup, Princeton, N. J., assignor to Ajax Electrothermic Corporation, Trenton, N. J.

In inductive heating free from interthreading by transformer iron, the process of efficiently using alternating currents within the range of frequency of generation by rotary multipolar generators which consists in confining the current path to a single layer of turns about the charge and in maintaining such a relation of frequency to diameter of the charge that the induced electromagnetic energy shall not penetrate substantially beyond the axis of the charge.

1,695,038. December 11, 1928. **Magnetic Alloy.** Oliver E. Buckley, Maplewood, N. J., assignor, by mesne assignments, to Western Electric Company, Incorporated, a Corporation of New York.

A nickel iron alloy comprising nickel and iron, the nickel being between 80% and 83% of the total iron-nickel content, and having higher permeability than iron at magnetizing forces less than a few tenths of a c. g. s. unit.

1,695,239. December 11, 1928. **Method of Preventing Warpage of Castings in Cooling.** Allen B. Norton, Cleveland, Ohio, assignor to Aluminum Company of America, Pittsburgh, Pa.

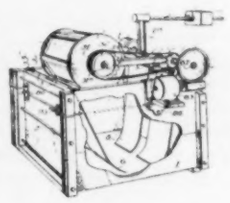


The method of treating aluminum alloy castings, which comprises taking the hot castings directly from the molds, placing them upon a surface of the desired configuration, clamping them to said surface, and allowing them to cool while so clamped.

1,695,430. December 18, 1928. **Agent for Cleaning and Imparting Rust-Inhibitive Properties to Steel.** James D. Klinger, Detroit, Mich.

A solution to be used for cleaning and imparting rust resisting properties to steel containing a hydroxycarboxylic acid.

1,695,795. December 18, 1928. **Plating Tank.** William E. Belke, Chicago, Ill.

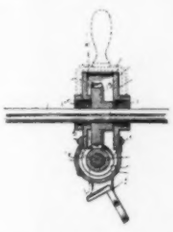


In an electroplating device, a tank for an electrolytic solution, an anode for contacting the solution, a pair of supporting arms each having a transverse shaft journaled thereto, a container for the pieces to be electroplated rotatably mounted on said shafts, an arbor having depending slotted ends adapted to be detachably supported by said shafts, a plurality of contact fingers depending from the arbor, means for immersing the container in the solution, and means for rotating the container.

1,695,845. December 18, 1928. **Alloy Base for Oxide-Coated Cathodes.** George W. Hallock, Bloomfield, N. J., assignor to Westinghouse Lamp Company, a Corporation of Pennsylvania.

An electrically conductive core for a thermionically active cathode comprising an alloy of nickel and silicon.

1,697,240. January 1, 1929. **Electroplating Apparatus.** Forest H. Hartzell, Dayton, Ohio.

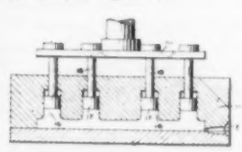


A variable driving mechanism of the character described wherein a revoluble plating drum or the like is rotated in various positions of shifting movement transversely in relation with its axis of rotation, characterized by a worm, a worm gear normally meshing therewith, an oscillatory support for the worm gear swinging concentrically in relation with the worm, and an eccentric revoluble mounting for said worm gear in said support adapted by its oscillation to shift the worm wheel into and out of mesh with said worm independent of the swinging adjustment of the support.

1,697,715. January 1, 1929. **Solder for Aluminum.** Jeremiah Butler, Oxford, Pa., assignor of one-half to Isaac P. Walton, Oxford, Pa.

A composition of soldering matter for aluminum consisting of steel filings one pound, block tin twenty-five pounds, steel one-half ounce, borax three and one-half ounces, plaster of Paris four ounces, salt one pound, and twelve ounces of silver.

1,697,741. January 1, 1929. **Manufacture of Die Castings.** Conrad Vaughan, Handsworth, Birmingham, England.



Apparatus for the manufacture of die castings comprising a mold, and a fluid actuated plunger within said mold adapted to recede therein under the action of the fluid entering the mold.

1,697,771. January 1, 1929. **Anode for the Electrolysis of Copper Solutions.** Frederick Laist and Frederick F. Frick, Anaconda, Mont.

Anodes for the electrolysis of copper solutions composed of alloys of lead, antimony and arsenic.

1,697,845. January 8, 1929. **Soldering Material.** John Herbert Adams, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y.

A new article of manufacture, comprising an enamel-removing flux core consisting solely of 1 part naphthalene and 2 parts rosin, covered by an extruded soldering material.

1,698,472. January 8, 1929. **Process of Making Metal Foils.** John R. Cain, Washington, D. C., assignor to The Richardson Company, Lockland, Ohio.

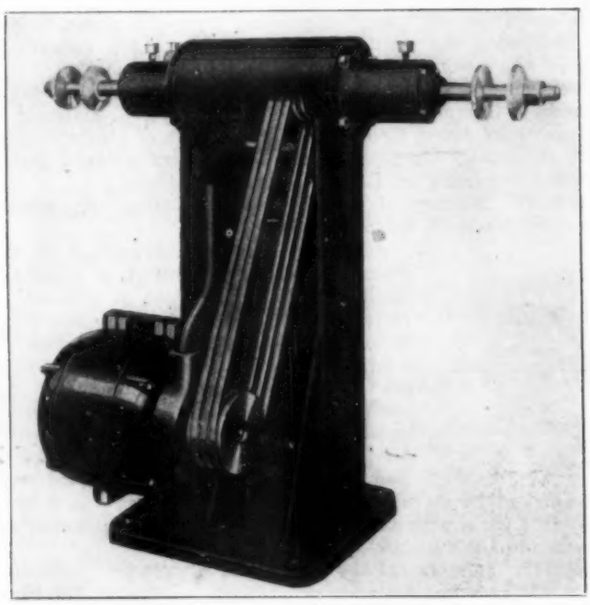
A process of forming metal foil which consists in depositing a metal powder on the surface of an electrolyte, said powder being of a nature to float thereon, and maintaining it in an integral film maintaining contact with the film formed by said powder deposition with a spongy electrode, and providing an anode, and passing an electric current through said electrode and anode.

Equipment

New and Useful Devices, Machinery and Supplies of Interest

Polishing and Buffing Lathes

Designed primarily for buffing automobile fenders, the new line of "Rite-Speed" polishing and buffing lathes manufactured by the Hill-Curtis Company, Kalamazoo, Mich., are stated to be suitable for a wide range of work requiring maximum working room for two operators. The machine, as shown in the illustration, has a spindle 80 inches overall. It is designed with a Multi-V Texrope drive, and any desired spindle speed can be obtained, the makers state. Speeds are changed by changing motor pulleys.



Polishing and Buffing Lathe

The motor with which the machine is equipped is of 40° Centigrade, said to operate smoothly and noiselessly, and designed to withstand momentary overloads of 100% of rated capacity. It is equipped with Hill-Curtis air cleaner which filters all air reaching the motor. The motor is mounted on the back of the pedestal, where it is easily accessible. Push-button remote control and automatic motor starter, thermal overload protection and spindle lock are standard equipment. Optional with purchaser is a choice of either Timken tapered roller bearings or Fafnir ball bearings. Motors can be supplied for either direct or alternating current, in 3, 5, 7½, 10 or 15 horsepower.

Permalloy Made in Induction Furnace

In connection with the development of the new alloy, permalloy, for use in trans-oceanic cables and other apparatus, the laboratories of the Western Union Telegraph Company used an Ajax-Northrup high frequency induction furnace, according to a statement issued by the Ajax Electrothermic Corporation of Trenton, N. J., makers of the furnaces. This type of furnace was also used, it is stated, in developing "mumetal," another alloy used for cable work of the telegraph company. The metals are both remarkable in that they make it possible to transmit messages at much greater speeds than anything used for cables previously. The Ajax company states that both metals were not only discovered, but have been commercially manufactured in their furnaces. The carbon content of the alloys must be kept very low, it is stated, a few hundredths of one percent being the maximum. With the Ajax furnaces it has been possible to keep the carbon content down to amounts measured in thousandths of a percent, it is stated.

According to the furnace makers, the Western Union made efforts for four or five years to find a nickel-iron alloy of extremely high permeability at low magnetizing force. They were using a carbon resistor electric furnace. It was possible to make only one or two melts per day and the carbon content could not easily be kept down. When a small Ajax high frequency furnace was first installed, a schedule was started calling for a melt every forty minutes. It is possible to make a melt in as short a time as five minutes with more modern Ajax equipment, it is claimed.

Hundreds of melts with different percentages of nickel and iron were made, and within a few months the new alloy, permalloy, was announced. The composition is approximately 78½% nickel and 21½% iron. Small quantities of other metals are added to make "mumetal."

Admiralty Condenser Tubes

The Scovill Manufacturing Company, Waterbury, Conn., manufacturers of copper, brass and other non-ferrous metal products, have issued some interesting data in regard to their product known as Scovill Cup Drawn Admiralty Tube.

Since the manufacture of this tubing was begun, it is stated, there have been many instances where it has given remarkable service, and occasionally some outstanding occurrence is brought to the company's attention. One such was their experience with the Marine Department of the Lehigh Valley Railroad Company.

In 1921, when the quality of Cup Drawn Admiralty Tube was known only by word of mouth, the chief engineer, E. F. Grimes, advised the Scovill Company that his department had an apparently insuperable difficulty in that tubes installed in the condensers of their tugs, operating in New York Harbor, showed failures as early as six months after installation. Tubes which lasted nine months were considered good, and the occasional installation which survived for twelve months was considered excellent.

The theories back of the Scovill tube were expounded to Capt. C. M. Moore, superintendent of floating equipment; E. F. Grimes, chief engineer of floating equipment; and to New York Office. G. H. Emery, assistant engineer, and these men made a trial of this material in spite of the fact that the price was considerably higher than the price of any admiralty tube made by other processes.

Lehigh Valley Railroad Tug "Slatington" Equipped with Scovill Condenser Tubes

It required courage to purchase, or recommend, an untried material at 20 per cent above the market for what are represented as being standard articles, but the courage and foresight of these men was liberally rewarded, the Scovill company states. Instead of failure in six months, or nine months, or a year, these tubes were still in the tug "Slatington" on October 1, 1928. On that date visual inspection and pressure test indicated the probability of at least another year's service from this set of tubes.

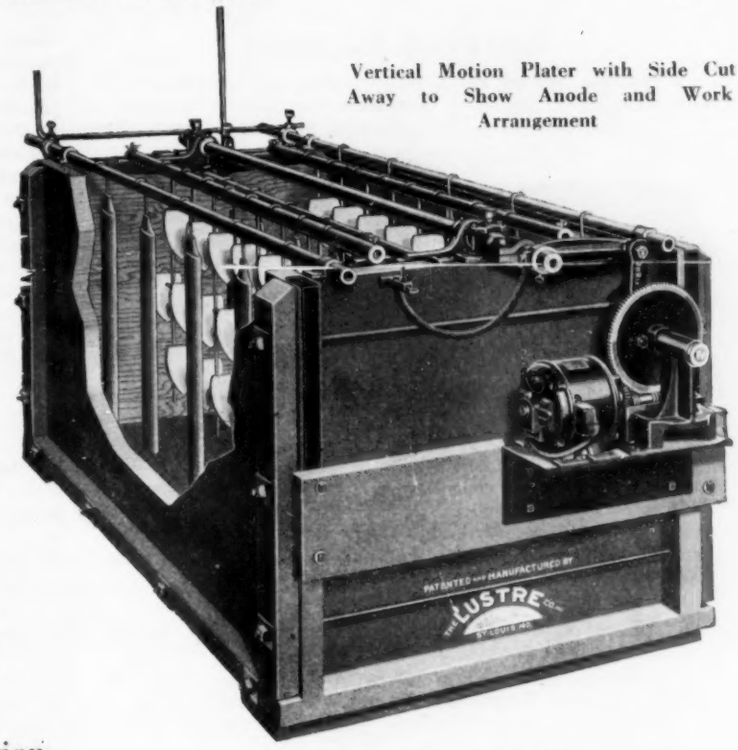
On the basis of the customer's best previous experience, this is a 700 per cent increase in life; and on the basis of their average previous experience an increase of 1,200 per cent, it is pointed out. In the interim, the Lehigh Valley Company has replaced the tubes in all of the other tugs of its harbor fleet as they completed their life cycle, with Scovill Cup Drawn Tubes.

Vertical Motion Plating Apparatus

A new type of plating apparatus has been placed on the market by The Lustre Company, Inc., 3307 North Broadway, St. Louis, Mo., which, the company reports, has found considerable favor in the industry due to certain advantages which are claimed for it. The company describes the apparatus to be, in effect, a vertical motion agitator attachment, which can be applied to any size of still tank. Users therefore do not need to purchase new tanks to use the equipment, but merely to supply dimensions of their tanks. The apparatus is furnished with a ¾ horsepower electric motor, with driving gears, link arms and rocker arms, anode and cathode rods and all electrical connections. Without interruption of work in plant, according to The Lustre Company, the equipment can be installed on a tank by the plater in about an hour. No change of solution is required.

When in operation, the motion of the rocker arms is slow enough to permit platers to put in and remove work without stopping the machine. It is claimed that the machine plates three to four times as fast as a still tank, and it can be used for copper, nickel, silver, cadmium or chromium plating.

Among other advantages claimed for this machine are elimination of all uneven densities and pressures attending some kinds of mechanical plating; no breakage of wire used to suspend work; no rubbing of one piece against another.



Vertical Motion Plater with Side Cut Away to Show Anode and Work Arrangement

Magnesium in New Electrical Insulation

"Corox" is the trade name applied to a new type of insulating material. This new material makes possible the production of electrical heating devices with higher efficiency and longer life than can be secured with the use of mica, asbestos or other standard insulating materials, according to its makers, the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. "Corox" has a higher insulating value and at the same time higher heat conductivity than other materials generally used to insulate electric heaters, it is claimed. An unusual feature of this new insulation is that it is made from metallic magnesium, a conductor of electricity. The "Corox" heating element consists of a copper tube, the metallic magnesium, and a resistance wire. The actual heating element, which is resistance wire, is wrapped with metallic magnesium ribbon, and the whole is then inserted in a copper tube. Next, high pressure steam is forced through the tube, causing a chemical reaction which changes magnesium metal into an oxide and changes the ribbon from a conductor to an insulating material. The result is a tube containing a heater wire which is embedded in a hard, dense, white substance resembling marble. The ends of the tube are then sealed up, with electrical contacts projecting, and the tube itself can be formed to any of a multitude of shapes. It can be soldered, brazed, or otherwise assembled in any desired mounting. The heating unit thus formed is almost indestructible in normal use, it is stated.

This process was invented by Christian B. Backer of Norway. The Westinghouse company purchased the American rights several years ago and research engineers have been engaged ever since on the problem of reducing the Backer principle to practice. This work has now been successfully completed and the new insulation is being regularly used in many of the company's products, including waffle irons, percolators, water heaters, and other electrical appliances.

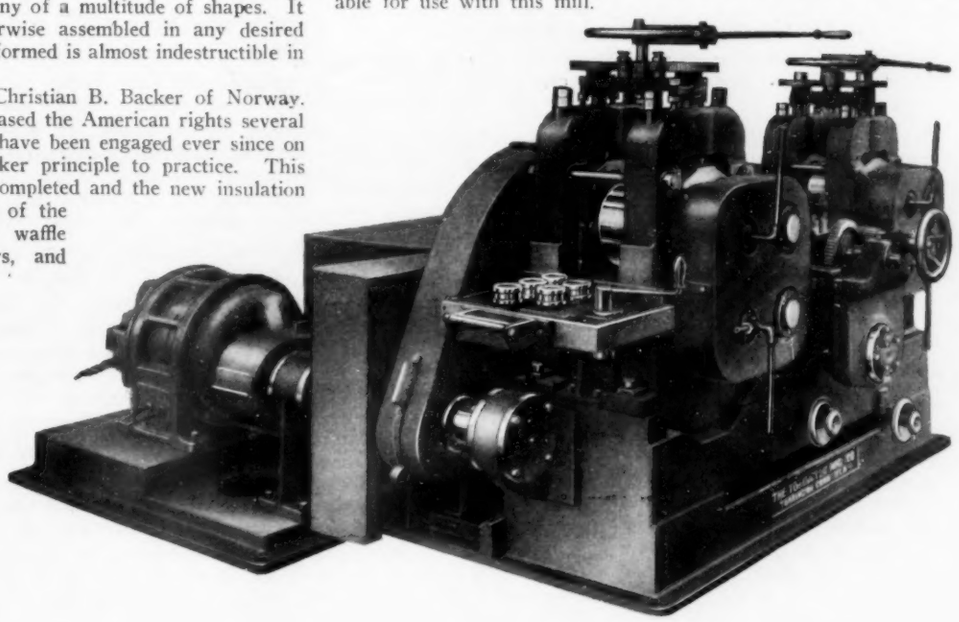
New Type Wire Mill

The Torrington Manufacturing Company, Torrington, Conn., announces a new type of wire mill for the manufacture of flat wire with round edges or round corners. In regard to the machine the company offers the following description:

A new design of tandem rolling mill for the high speed production of flat wire, with round edges or round corners, such as flat electrical conductors or wire of any other material having a similar shape. Many sizes of flat wire may be finished in a single pass through the machine, from round rod.

The mill consists successively of horizontal breaking down rolls, vertical grooved edging rolls and horizontal finishing rolls, all driven by one motor with a varying speed relation secured by the use of multiple plate disc frictions adjustable while running.

The mill is equipped throughout with "SKF" ball and roller bearings, making possible the attainment of greatly increased rolling speeds. Sykes double helical driving gears are used. Breaking down and finishing rolls are water cooled. Facility is provided for the quick and accurate adjustment of all rolls. Complete guides are included. Suitable winders of several designs are available for use with this mill.



Newly Developed Machine for the Manufacture of Flat Wire of Various Kinds

Acid-Proof Stoneware

A complete line of acid-proof stoneware for industrial use is manufactured by the U. S. Stoneware Company, with works at Akron, Ohio, and New York office at 52 Church Street, New York City. This line includes pots for containing acids, alkalis or other corrosive substances, which are stated to be highly heat-resistant and are made with or without glaze. These are made in regular sizes ranging from 5 to 60 gallons, from 11 to 24 inches inside diameter and from 14 to 31½ inches high. Covers and special sizes are also available, up to 300 gallon capacity. Dipping baskets of strong, non-porous vitrified chemical stoneware are made in a variety of sizes and shapes, with handles such as are shown in the illustration herewith. Acid pitchers of chemical stoneware are made in 2 quart, 1 gallon and 2 gallon sizes. It is stated that these have long pouring lips and well fitted handles.

Various Types of Acid-Proof Stoneware

The makers state that these products are suitable for plating and finishing plants. In this regard it might also be stated that the company produces a line of one-piece, vitrified stoneware, acid-proof tanks for electroplating, galvanizing, pickling, etc. They are made in sizes ranging from 4 to 119 gallons, and also in special sizes to order. The tanks are rectangular in shape and are made with or without glaze. The company states that these are guaranteed to be acid and corrosion proof.

Old Racks, Baskets, Etc., Bought

Fuhrman and Lundberg, 1352 South Canal Street, Chicago, Ill., advise that they are steadily in the market for old platers' racks, hooks, baskets, etc. This firm desires only apparatus made of copper or brass, no iron, but the metals deposited on the outside can be any of the ordinary electrodeposits in commercial use.

Equipment and Supply Catalogs

Krometal Seals. Art Metalabel Corporation, York, Pa.

High Pressure Rotary Gas Pumps. The P. H. and F. M. Roots Company, Connersville, Ind. Engineering data in 16 page booklet.

Alpro Educational Service. Alloys and Products, Inc., Oak Point Avenue, New York City. A fine loose-leaf binder with a large amount of data on various "Alpro" alloys, designed to aid the practical man in the plant, as well as the technician, in acquiring a wider knowledge of alloys. The bulletins will be issued periodically and may be had gratis upon request to the company. The first issues deal mainly with brass foundry practice. Future issues will cover other branches of foundry and metal work.

Perpetual Calendar. Taunton-New Bedford Copper Company, Taunton, Mass. A fine bronze frame holding a calendar made of celluloid, capable of serving indefinitely. It is an excellent example of the metal this company produces.

Telephone Almanac. American Telephone and Telegraph Company, New York City. A perennial achievement, this almanac is concise but well filled with a great variety of information which is useful as well as interesting. The format is very fine, having the smack of old times while being in fact extremely modern.

General Electric Company, Schenectady, N. Y., publications: Some Outstanding Achievements of 1928; Type AW Resistor Arc Welders.

Announcing the Ross "Senior". The Ross Manufacturing Company, Cleveland, Ohio. Pamphlet on a wheel truing which, according to the makers, has remarkably long bearing life.

Tell Tale Tales. By Frederic B. Stevens, president, Frederic B. Stevens, Inc., Detroit, Mich. A fine 96-page book of essays and stories by one of the country's leading manufacturers of foundry facings, platers' and finishers' supplies and allied products. Mr. Stevens writes well, in a style calculated to appeal to the practical man in industry as well as to executives and others. This is another of the T. Series, of which there have been nine books thus far, the first, "This and That," appearing in 1915. Mr. Stevens is also the author of "The Milk in the Cocoanut," an article that appeared in THE METAL INDUSTRY October, 1928, and now in "Tell Tale Tales."

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

Institute of Metals Division

HEADQUARTERS, ENGINEERING SOCIETIES BUILDING, 29 WEST 39th STREET, NEW YORK CITY

Annual Meeting

In conjunction with the annual meeting of the American Institute of Mining and Metallurgical Engineers, extending over five days from February 18 to 22, 1929, the Institute of Metals Division will hold its annual sessions, dinner, etc. The Institute will begin its activities on Tuesday evening, February 19, at 6 p. m., when the dinner will be held at the Savoy Plaza Hotel; ladies invited. There will be an address by A. J. Wadhams on Nickel and Its Alloys. The sessions and papers of the Institute will be as follows:

Wednesday, February 20

9:30 a. m.—General Session, Auditorium Engineering Societies Building. W. B. Price, Chairman.

Dispersion Hardening in Copper and Silver Base Alloys—By J. L. Gregg.

The Heat Treatment and Mechanical Properties of Some Copper—Zinc and Copper-tin Alloys Containing Nickel and Silicon—By W. C. Ellis and E. E. Schumacher.

High Strength Brasses—By O. W. Ellis.

Some Observations in the Heat-treatment of Muntz Metal—By L. R. Van Wert.

A Metallographic Study of Tungsten Carbide Alloys—By J. L. Gregg and C. W. Küttner.

2 p. m., Auditorium—General Session—H. M. St. John, Chairman.

Gases in a Sample of Overpoled Fire-refined Copper—By O. W. Ellis.

Incipient Shrinkage in Some Non-ferrous Alloys—By J. W. Bolton and S. A. Weigand.

Equilibrium Relations in Aluminum-magnesium Alloys of High Purity—By E. H. Dix, Jr., and F. Keller.

Effect of Arsenic on Dispersion Hardenable Lead-antimony Alloys—By K. S. Seljesater.

Some Practical Aspects of Creep in Zinc—By William M. Peirce and E. A. Anderson.

Thursday, February 21

9:30 a. m., Auditorium—Corrosion Symposium—Dr. Ulick R. Evans, Honorary Chairman; Herbert A. Bedworth, Chairman; Paul D. Merica, Vice-chairman.

Corrosion of Metals as Affected by Stress, Time and Number of Cycles—By D. J. McAdam, Jr.
Some Aspects of Corrosion Fatigue—By T. S. Fuller.
Corrosion of Tin and Its Alloys—By C. L. Mantell.
Corrosion of Metals in the Lehigh Valley—By C. E. Reinhard.
The Inhibition of the Corrosion of Aluminum by Soaps—By H. V. Churchill.
Correlation of Laboratory Corrosion Tests with Service: Weather Exposure Tests of Sheet Duralumin—By H. S. Rawdon.

2 p. m., **Auditorium—Corrosion Symposium** (Continued Session). Resistance of Copper-silicon-manganese Alloys to Corrosion by Acids—By H. A. Bedworth.
Quantitative Measurement of the Corrosion of Metals in Water and Salt Solutions—By G. D. Bengough, J. M. Stuart and A. R. Lee.
Resistance of Iron Nickel Chromium Alloys to Corrosion by Acids—By N. B. Pilling and D. E. Ackerman.
Some New Developments in Acid-resistant Alloys—By Burnham E. Field.
Practical Application to Corrosion Tests—By Robert J. McKay, O. B. J. Fraser and H. E. Searle.

4 p. m., **Auditorium—Institute of Metals Division Lecture**—F. W. Bradley, Presiding; S. Skowronski, Vice-chairman.
The Passivity of Metals and Its Relation to the Problems of Corrosion—By Dr. Ulick R. Evans.

Baltimore-Washington Branch

HEADQUARTERS, CARE OF G. F. P. TURNER, 5324 MAPLE AVENUE, BALTIMORE, MD.

Annual Meeting and Banquet

The first annual educational session and banquet of the Baltimore-Washington Branch of the American Electroplaters' Society, held at the Emerson Hotel, Baltimore, January 26, was a complete success, the attendance being in excess of all expectations. The programs of the various events were remarkably fine, especially in view of the fact that this is a new branch.

The educational session, which started at 3:30 p. m., drew a large number of electroplaters. The session was in charge of **Dr. William Blum**, of the United States Bureau of Standards, a widely known electroplating expert. Dr. Blum read a letter from **Charles H. Proctor,** founder of the Society, in which Mr. Proctor outlined the history of chromium plating. After this, Dr. Blum spoke on research in the deposition of chromium.

Oliver J. Sizelove, of Newark, N. J., gave a paper on Methods of Chromium Plating.

The General Application of Chromium Plating was described by **George B. Hogaboom,** of Matawan, N. J.

The Application of Chromium in Ordnance was described by **Mr. McKinney,** of the United States Navy Yard, Washington, D. C.

Mr. Slattery, of the United States Bureau of Printing and Engraving, spoke on the application of chromium plating to printing plates.

The banquet brought together 111 persons, who enjoyed a fine dinner. There were favors for the ladies and smokes for the men. There was singing by **Messrs. Slattery and Garrison.**

There were several delegations from other branches. **Horace H. Smith,** Supreme President of the American Electroplaters' Society, was present, heading a delegation from Newark, N. J.

There was dancing until midnight and the evening ended with everyone in perfect agreement as to the fine time that was participated in by all who attended.

—G. F. P. TURNER, Secretary.

New York Branch

HEADQUARTERS, CARE OF R. J. LIQUORI, 2429 HUBBARD STREET, BROOKLYN, N. Y.

Annual Meeting, January 16

Electroplaters and their friends are cordially invited to attend the nineteenth annual educational session and banquet of the New York Branch of the American Electroplaters' Society, to take place February 16, 1929, at the Aldine Club, 200 Fifth Avenue, New York City. The session begins at 3:30 p.m. and the banquet at 7:30 p.m. There will be a number of excellent papers on various electroplating subjects. Reservations should be made as early as possible by communication with the secretary at the address above.

International Fellowship Club

HEADQUARTERS, CARE OF F. J. CLARK, 43 FORT PLEASANT AVENUE, SPRINGFIELD, MASS.

Annual Luncheon at New York

The International Fellowship Club will hold its annual luncheon at the Aldine Club, 200 Fifth Avenue, New York City, on February 16, during the annual session of the New York Branch of the American Electroplaters' Society.

American Electrochemical Society

HEADQUARTERS, CARE OF COLIN G. FINK, COLUMBIA UNIVERSITY, NEW YORK CITY

Toronto Meeting in May

The American Electrochemical Society will hold its Spring convention at Toronto, Canada, May 27, 28 and 29, 1929. The dates have been made late in order to permit Canadian members to take advantage of reduced fare schedules which go in effect May 24 in Canada, and also because Toronto University buildings will then be available for the meetings. Hart House, Toronto University, will provide meals for the convention, and other elaborate facilities for the sessions are to be provided by the University. The dormitories are to be used as sleeping quarters. Prof. Lash W. Miller of Toronto is to be in charge of the local committee. He promises a number of interesting plant visits, a large "get-acquainted" meeting, and other events. Further announcements, programs, etc., will be included in a future announcement.

Non-Ferrous Ingot Metal Institute

HEADQUARTERS, CARE OF BENJAMIN HARRIS AND COMPANY, CHICAGO, ILLINOIS

Reports on several projects sponsored by this organization were heard at a meeting held at Detroit on January 17, at which time action was taken on some of the work planned. A resolution was adopted which authorizes a survey of costs and accounting procedure in ingot metal production. Figures of individual firms will not concern the Institute, the general scheme being to develop uniform methods and practice which may result in savings for all.

It is expected that some time later, research will be undertaken in a co-operative manner. An investigation of collective purchase of insurance has been under way for some time, and it was stated at the meeting that there are indications that important savings may soon be effected in the purchase of one form of insurance which every ingot producer must carry. Burglary and hold-up insurance were also discussed at length.

Artistic Lighting Equipment Association

HEADQUARTERS, 711 GRAYBAR BUILDING, LEXINGTON AVENUE, NEW YORK CITY

Annual Meeting Held

The Artistic Lighting Equipment Association held its eighth annual meeting, together with the Illuminating Glassware Guild, at the Cavalier Hotel, Virginia Beach, Norfolk, Va., February 5 to 8, inclusive. There were a large number of sessions, but an extended report is not available as this issue goes to press before the meeting is ended.

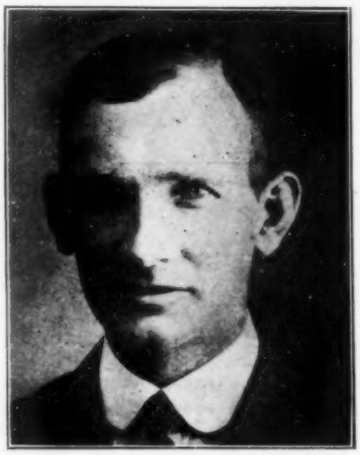
Foreign Trade Convention

The National Foreign Trade Council of the United States will hold the Sixteenth National Foreign Trade Convention at Baltimore, Md., April 17 to 19, inclusive, 1929. All persons and concerns interested in foreign trade are invited to participate. The secretary of the Council is O. K. Davis, India House, 1 Hanover Square, New York City.

Personals

Ulick R. Evans

Ulick Richardson Evans, the special lecturer of the Institute of Metals Division for 1929, was born March 31, 1889, at Wimbledon (near London) and was educated at Marlborough College (1902-1907), and at Cambridge University (1907-1911), where he gained an "Exhibition" at King's College; he took his B.A. degree in 1910, and M.A. in 1914. During 1913 and 1914 he was associated with Dr. E. K. Rideal in electrochemical consulting work in London. From August 1914 until 1919 he was in the British Army, first in the infantry and then in the signal service, being during the last part of the period attached to the Indian Army in Palestine.



Ulick R. Evans

Returning to Cambridge University in 1920, he devoted three years to writing a four-volume book on "Metals and Metallic Compounds."

He has also published, at different times, several papers on other scientific subjects including "fuel cells," "recrystallization in metals," "colloid-chemistry," and "electro-tanning." Much of this work has been conducted alone, but there have been joint papers with E. K. Rideal, L. L. Bircumshaw, M. Cook, R. T. M. Haines and others. In 1924 appeared the first edition of his book on the "Corrosion of Metals"; the second edition, greatly altered owing to the advances made in the intervening two years, was published in 1926; this book has been translated into German (1926) and French (1928).

He has lectured at Cambridge University for the past five years, and has delivered a number of occasional lectures in London and elsewhere.

W. C. Neilson of Philadelphia, Pa., has been elected a vice-president of the Aluminum Company of America, Pittsburgh, Pa. Mr. Neilson has charge of the company's bauxite interests.

Edgar H. Bristol, president of The Foxboro Company, Foxboro, Mass., sailed from New York City on the S.S. Santa Teresa, January 31, for an extensive tour through South America.

E. S. Fickes of Pittsburgh, Pa., formerly vice-president in charge of engineering, was elected a director of the Aluminum Company of America at a meeting of the board of that company on January 31, 1929.

Harry B. O'Brien, vice-president and general manager of the International Silver Company, Meriden, Conn., has resigned to become affiliated with the Gorham Company, Providence, R. I., of which he has been elected a vice-president.

Paul H. Henning, formerly an official of the Detroit Screw Works, Detroit, Mich., has become affiliated with the Wise Industries, Detroit, platers of nickel, cadmium, chromium, etc., operating besides its plating departments, stamping, spinning, polishing and other divisions.

A. M. Oliver, for the past six years a member of the advertising department of the Goodyear Tire and Rubber Company, Akron, Ohio, is now advertising manager for the Pangborn Corporation, Hagerstown, Md., manufacturers of sand blast and dust-arresting equipment, etc.

C. E. George, for many years western manager for the American Schaeffer and Budenberg Corporation of Brooklyn, N. Y., has joined the Taylor Instrument Companies, Rochester, N. Y., as a member of the Chicago sales staff, with headquarters at 58 East Washington Street, Chicago.

C. W. Yerger, eastern district manager of The Cutler-Hammer Manufacturing Company, will assume the duties of sales manager of the Hanson-Van Winkle-Munning Company of Matawan, New Jersey, on March 4th, 1929. This step has become necessary in order to enable E. N. Boice, secretary, who in addition to his other activities has been directing the sales of the company, to give full time to his executive duties.

Mr. Yerger has been associated with the Cutler-Hammer Company since 1908. Before becoming eastern district manager he was successively engineer, Pacific Coast representative, and manager of the Cincinnati, Washington, and Boston offices, in addition to spending approximately 18 months in England in the company's behalf.

Obituaries

Jesse L. Jones

After an illness of several months, Jesse L. Jones, aged 63 years, of 198 Dewey Avenue, Edgewood, Pa., died on January 21, 1929, at Green Cove Springs, Florida. He was chief chemist of the Westinghouse Electric and Manufacturing Company, and metallurgical editor of THE METAL INDUSTRY. He leaves his wife, Mrs. Florence Shinn Jones, one son, Jesse L. Jones, Jr., and one daughter, Florence Jones.

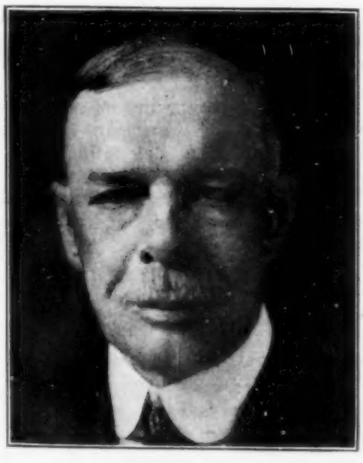
Mr. Jones was born October 17, 1865, at Martin's Ferry, Ohio. He was graduated with the degree of Bachelor of Arts from Ohio State University in 1890. His first position was that of assistant chemist with the State Chemist of Ohio. He afterward did chemical work with several steel companies and in 1893 he went with William Cramp & Sons Ship and Engine Building Company of Philadelphia. He assisted in introducing to the United States, Parson's manganese bronze and white brass. In 1902 Mr. Jones entered the employ of the Westinghouse company, remaining with them until his death.

His work with the Westinghouse company in metals brought him recognition as one of the foremost metallurgists of the United States. On January 16, 1929, the Board of Awards of the American Foundrymen's Association voted to award the Joseph S. Seaman medal to Mr. Jones for meritorious service to science. Mr. Jones did not live to learn of this honor.

He was a member of numerous technical societies, being very active in committee work for the American Foundrymen's Association, American Society for Testing Materials and the Institute of Metals Division. He was a member of the Board of Directors of the American Foundrymen's Association.

An Appreciation from W. J. Reardon

"I have just learned that our dear friend, Jesse L. Jones, passed away in Florida, January 21st.



Jesse L. Jones

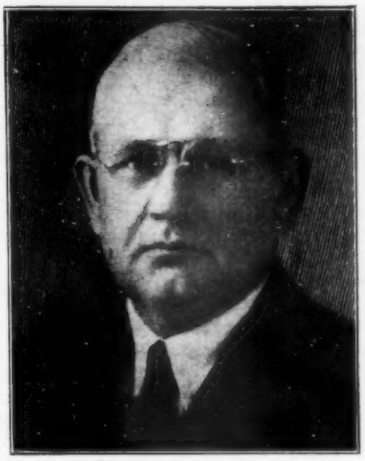
"He was surely a great man and one of whom all foundrymen are proud. I was deeply grieved to learn of his death. He is not only a loss to his immediate family, but to the entire foundry world. He stood foremost among metallurgists of this country, devoting himself with great earnestness and wisdom to improve the metal industry.

"I knew Mr. Jones for over a quarter of a century and worked with him under many conditions. Working with him for sixteen years, I developed a high admiration for his ability and had the utmost confidence in his judgment

"He was nationally known and universally respected by all his friends and associates, of whom he was always most considerate. No foundryman that ever asked Mr. Jones for advice and information, failed to get more than he expected. His only failing that I know of was that he never took any credit for himself."

Thomas A. DeVilbiss

Thomas A. DeVilbiss, president and son of the founder of The DeVilbiss Company, Toledo, Ohio, manufacturers of spraying equipment, died November 9, 1928, at the age of fifty years. Mr. DeVilbiss was widely known not only as an important manufacturer and originator of equipment which practically revolutionized the painting industry, but also as a great philanthropist and civic leader.



Thomas A. DeVilbiss

Mr. DeVilbiss was born July 29, 1878, at Hoagland, Indiana, the son of Dr. and Mrs. Allen DeVilbiss. His father was the inventor of a metal spray for the treatment of nose and throat diseases and this invention led directly to his son's subsequent building of the great industry which now bears his name. Thomas, as a boy, aided his father in the production of the throat spray, which became world-known. Later, as a young man, Thomas took up the manufacture of these sprays and gradually extended the line of production to perfume sprays, then to sprays for industrial uses, such as in painting and finishing metals, wood and other surfaces. In this field he was a pioneer, and his ideas were of greatest importance to the automobile and other large American industries. He became president of the company in 1917, when his father died.

Mr. DeVilbiss was considered one of the finest men ever produced in the Middle West, and his death was mourned in many cities there, especially his own city, Toledo, where he had been active in civic and philanthropic work all the years of his life.

He is survived by his widow, his mother, a son, Howard, a daughter, and two sisters.

Franklin H. Kalbfleisch

Franklin H. Kalbfleisch died at his home in Babylon, Long Island, on January 30th, 1929. He was born in Brooklyn, N. Y., on March 3rd, 1846, and spent his lifetime in the chemical business. Mr. Kalbfleisch was a son of Martin Kalbfleisch, who came to this country from Holland (his birthplace) in 1829 and established the chemical business which Franklin H. Kalbfleisch entered in 1870.

During his lifetime Mr. Kalbfleisch organized many companies in various branches of chemical manufacture and later these were consolidated into The Kalbfleisch Corporation, of which he was the head until 1920, when, due to ill health, he retired from active participation in the business.

Mr. Kalbfleisch was a man of resolute personality but of kindly and generous disposition and enjoyed the respect of all who knew him. He leaves two daughters, Miss Maud Kalbfleisch and Miss Augusta S. Kalbfleisch.

Herbert S. Rowland

Herbert S. Rowland, former treasurer of the Berbecker & Rowland Manufacturing Company, died at his home, 189 Hillside avenue, Waterbury, Conn., on January 16, 1929. He was 63 years old. He was educated at the Fairfield Academy and the South Berkshire Institute and entered the employ of the Waterbury Buckle Company in 1885.

He left there in 1894 and obtained an interest in the Tucker Manufacturing Company, which made brass nails. With Mr. Berbecker he then formed the Berbecker & Rowland Company, with the Tucker Manufacturing Company as a nucleus. He was first secretary and later treasurer. The company was bought last year by the Beardsley & Wolcott Manufacturing Company and Mr. Rowland became a director of the latter company.

He was married in 1884 to Susie S. North, daughter of Dr. and Mrs. Alfred North. His wife survives him, as does his son, Alfred N. Rowland, and one daughter, Mrs. Melville Grosvenor. He was a brother of the late Henry L. Rowland. He was a 32d degree Mason, a Knight Templar, an Odd Fellow and a member of the Waterbury Club. Burial was in Waterbury. —W. R. B.

William G. Allen

William G. Allen, founder of the Allen Screw Manufacturing Company and formerly president of the American Specialty Company, both Hartford, Conn., firms, died on December 28, 1928, at his home in that city after a prolonged illness. Mr. Allen was 67 years old.

Mr. Allen was a well-known mechanical expert and inventor. He had a number of patents to his credit, and had aided in the development of the Wright die machine, made by the Henry Wright Manufacturing Company, with which he also had a connection.

Mr. Allen is survived by two sisters. —W. R. B.

John H. Geddes

John H. Geddes, a draftsman at the plant of the Torrington Manufacturing Company, Torrington, Conn., was killed on January 23, 1929, when part of a train on which he was a passenger left the tracks and was wrecked between Bridgeport and Winsted, Conn. Mr. Geddes was very well known both through his connection with the Torrington company and because he was a very successful amateur playwright. His father, the late Samuel Geddes, was a well known mechanical engineer, having enjoyed the distinction of installing the engines in the famous battleship Kearsarge.

Cornelius A. Bickett

Cornelius A. Bickett, chairman of the board of directors of the Chicago Bearing Metal Company, and vice-president and director of the Magnus Company, Inc., also a Chicago manufacturing concern, died December 25, 1928, at his winter home at Miami Beach, Florida. Mr. Bickett was 64 years old. He was well known in the central west as a figure in the coal business, in which he was interested before he went into the metal field. He was a native of Cincinnati.

Albert E. Hathaway

Albert E. Hathaway, a well known manufacturing jeweler of Attleboro, Mass., died there on December 30, 1928, after a very prolonged illness. Mr. Hathaway had been in the jewelry industry practically the whole of his business life. As a young man he became superintendent of the R. Blackinton Company, where he served for fifteen years, then joining the James E. Blake Company as a partner. About three years ago he retired.

G. A. Doeright

G. A. Doeright, president of the Falcon Bronze Company, Youngstown, Ohio, died on January 4, 1929. He was 58 years old and had been the head of the Falcon company for many years. He was very well known in the metal trades.

W. A. Thegen

W. A. Thegen, head of William Thegen's Son, jewelry manufacturers, Philadelphia, Pa., died at his home in Rutledge, Delaware County, Pa., on January 2, 1929.

News of the Industry

Industrial and Financial Events

Jewelers Seek Higher Tariffs

Manufacturing jewelers in New England are seeking to have a revision of the United States tariff laws as regards the importation of jewelry. To this end, Congressman Joseph W. Martin, Jr., last month filed a brief in behalf of the New England Manufacturing Jewelers' and Silversmiths' Association, in which it is requested that adequate tariff protection be continued for articles which may be dropped from the present jewelry paragraph and placed in the metal schedule. Increased protection is also sought for the cheaper lines of silverware and jewelry now being imported into this country in considerable quantity from countries where labor costs are much lower than those prevailing here. A specific duty as well as an ad valorem rate will probably be suggested in regard to the cheaper lines of goods, according to a statement made by Congressman Martin.

New Aluminum Company Mill

The Aluminum Company of America, Pittsburgh, Pa., is constructing at Alcoa, Tenn., a new aluminum rolling mill for production of sheets and plates of strong aluminum alloys. All equipment is to be of latest design, electrically driven, on roller bearings. Power requirement for the new unit will be about 15,000 horsepower, and 500 additional men will be required. Initial monthly output will be 1,000,000 pounds, with ultimate capacity of about three times that amount. Operation of the new mill is expected to be possible by the coming fall.

DeVilbiss Company Reorganized

Due to the death recently of Thomas A. DeVilbiss, head of the DeVilbiss Company, Toledo, Ohio, reorganization of the management was found necessary and the following are now in charge of the spraying equipment firm: William M. Booker, chairman of the board; Allen D. Gutchess, president; Frank A. Bailey, vice-president and general manager; William F. Gradolph, general sales manager; Frank C. Penoyar, secretary; Walter W. Conklin, treasurer; Howard DeVilbiss, assistant secretary.

Courses in Engineering Offered

The University of Michigan, Ann Arbor, Mich., has issued Official Publication No. 17, October 27, 1928, outlining graduate courses in general chemical engineering, metallurgical engineering, gas engineering and organic chemical industries. Unusual facilities for advanced laboratory work are stated to be available, as well as the possibility of several industrial fellowships for graduate students next year. Full particulars may be had from the Chemical Engineering Department of the university.

Federated Metals Corporation

The annual financial report of the Federated Metals Corporation, New York City, and subsidiaries, shows for the year ended November 30, 1928, profits of $811,249.18, after interest, depreciation and Federal income tax, as compared with profit of $349,169.43, after interest and depreciation, in the fiscal year 1927. The profit for 1928 was the largest in the company's history and is equivalent to $3.29 per share earned on 245,843 shares no par capital stock, as compared with $1.42 a share earned in the fiscal year 1927.

Republic Brass Corporation

C. D. Dallas, of the Dallas Brass and Copper Company, Chicago, Ill., should have been included in the report of the formation of the Republic Brass Corporation which appeared on page 27 of our January issue. Mr. Dallas was elected vice-president and a director of the new concern, which now includes the Dallas company as a division.

Ancient Metalwork Unearthed

Scientists of the University of Pennsylvania Museum and the British Museum operating at Ur of the Chaldees, in Mesopotamia, have made numerous discoveries concerning the burial rites of Sumerian royalty 5,000 years ago, according to information received in this country from the expedition. Among the relics discovered are an ancient copper head of a statue, possibly the statue of a god, which is the first object of its kind yet discovered at Ur; gold head-dresses and rings, a number of silver vessels, daggers, copper vessels and numerous other prehistoric objects of great archeological value.

Plated Ware Census Data

The United States Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1928, the establishments engaged primarily in the manufacture of plated ware in 1927 reported products as follows: Silver-plated ware, valued at $45,853,897; nickel-silver ware, $5,665,766; other products, including plated ware other than silver-plated, $5,060,106; custom work and repairing, $140,213; making a total of $56,719,982, an increase of 4.4 per cent as compared with $54,330,033 reported for 1925, the last preceding census year.

Silversmithing and Silverware

The United States Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1928, the establishments engaged primarily in the manufacture of silverware in 1927 reported products valued as follows: Sterling-silver ware, $26,620,209; other products and receipts for custom work and repairing, $3,583,375; making a total of $30,203,584, a decrease of 7.2 per cent as compared with $32,531,670 for 1925, the last preceding census year.

Monel Metal Sink Designs

The International Nickel Company, Inc., 67 Wall Street, New York City, manufacturers of Monel Metal, have arranged with the Art Alliance of America, 65 East 56th Street, New York City, to hold a competition for best designs for Monel Metal sinks. Prizes will be given for designs considered best, and ideas are requested from artists, designers, metal workers, architects and others interested in the subject. Full particulars are available from the Art Alliance.

Standard Aluminum Castings Company

Resumption of operations at the plant of the Standard Aluminum Castings Company, Lansing, Mich., is expected within a short time, according to Louis Simon, manager. The full force is to be recalled, a part having already been notified. The company produces automobile castings of aluminum, holding contracts with the Reo and Olds companies.

William Schimper and Company

The completely equipped business for the manufacture of metal goods and novelties, together with equipment, good will, etc., of William Schimper and Company, 322 Ferry Street, Hoboken, N. J., is being offered for sale by the Industrial Plants Corporation, 25 Church Street, New York City. It is stated that the average annual business of the Schimper company over the past ten years has been approximately $300,000.

Scovill Manufacturing Company

Scovill Manufacturing Company, Waterbury, Conn., reports net profit of $2,698,508 after depreciation, taxes and charges in the year ended December 31, 1928, as compared with $2,252,218 in the preceding year.

The Platinum Market

The developments of the platinum market are discussed in an article in the February issue of "Commerce Monthly," published by the National Bank of Commerce in New York. It says in part:

Platinum is a commodity for which buyers as well as sellers are interested in maintaining prices on a stable and preferably rather high price level. Production of platinum is still far below the pre-war level, when Russia mined all but a fraction of world output.

Consumption of platinum during the last three years has been on a fairly even basis with the jewelry trade absorbing about two-thirds of the output.

For years platinum has been marketed by agreement through an agency which allocated to each country a specific production quota based on world consumption and the potential output of the country. The Russian break from the selling agreement occurred in the early part of 1927, when agents for the Soviet Government refused to renew their contract with the distributing agency. The result was two forces competing against each other with a consequent break in the market.

There is some reason to believe that Russia may seek a new understanding with the syndicate, and no doubt each side will be willing to modify its position.

Copper Consumption

Copper annually consumed by two major forms of transportation, automobiles and railroads, now reaches the large total of 340,000,000 pounds, according to surveys just completed by the Copper and Brass Research Association. Estimates of the Association indicate a total of approximately 1,786,000,000 pounds of copper now in use in passenger cars of American manufacture and in the railroad systems of the nation today.

About 250,000,000 pounds of copper are consumed by the automobile industry every year, the Association states. The small item of all tubing in crank cases alone requires approximately 2,000,000 pounds of the metal annually.

In discussing the use of copper on railroads, the Association estimates that between 75,000,000 and 100,000,000 pounds of the metal are consumed annually by this form of transportation. More than 850,000,000 pounds of copper and its alloys are now in use on American railroads, it declares, adding that "the increasing importance of electrification promises an even larger consumption of copper in the future." Present electrification represents about 100,000,000 pounds of copper and covers only a small portion of existing track mileage. The new electrification programs of the Pennsylvania and other roads are expected to add approximately 90,000,000 pounds of copper to these requirements.

Providence Jewelers Elect

The annual meeting of the Providence, R. I., Manufacturing Jewelers' Board of Trade was held there on January 25. Five new members of eight elected to the Board of Directors of the organization were Providence men, as follows:

Howard C. Baker of Baker-Manchester Manufacturing Company; Morgan W. Rogers of Parks Brothers and Rogers, Inc.; James O. Otis of Harvey and Otis; Frank M. Child of A. T. Wale Company and Walter Griffith of R. L. Griffith & Sons Company.

The three other members are:

Lawrence E. Baer of Baer and Wilde Company of Attleboro, Mass.; J. Irwin Shaw of Hamilburg, Shaw Corporation of New York City and J. Nelson Carter of Carter, Gough and Company, of Newark, N. J.

Ellis W. MacAllister, president of the Association, told the members present that while the past year was not exactly a prosperous one in the jewelry business, he believed business will be much better in 1929.

Evans-Wallower Lead Company

The Evans-Wallower Lead Company has obtained complete control of the Tainton process for the manufacture of superfine electrolytic zinc in the principal producing sections of the United States through acquisition of the rights formerly held by the Eastern Electrolytic Zinc Company, it was announced early this month by banking sources close to the company.

Five new directors will be added to the board of the Evans-Wallower Lead Company as a result of its expansion program. They are U. C. Tainton, inventor of the Tainton process; Victor Rakowsky, former president of Electrolytic Zinc Company; William McLellan, vice-president of Stone and Webster Engineering Company; William B. Given, American Brake-Shoe and Foundry Company and William Lloyd-Smith of the law firm of Cotton and Franklin.

Tin Foil and Collapsible Tubes

The United States Department of Commerce announces that, according to data collected at the biennial census of manufactures taken in 1928, the establishments engaged primarily in the manufacture of tin, lead, aluminum, and other foils (not including gold and silver) and collapsible tubes in 1927 reported products as follows: 16,168,654 pounds of tin foil, valued at $7,994,827; 40,212,317 pounds of lead foil, valued at $3,884,374; 38,784,900 pounds of aluminum and other foils, valued at $8,355,821; 2,999,183 gross of collapsible tubes (not including those made for use as containers of products manufactured by the same establishments), valued at $9,235,320; other products valued at $2,832,047; making a total value of $32,302,389. This total represents an increase of 7.5 per cent as compared with $30,060,306 reported for 1925, the last preceding census year.

Heavy Oil Used as Bus Fuel

Mitten Management, operating street railways and buses in Philadelphia, has developed a device whereby buses will utilize heavy fuel oil instead of gasoline in internal combustion engines, it was announced last month by J. A. Queeney, vice-president in charge of bus operation for the Mitten company. He stated that the device was adapted from an invention by Ernest Godward, of New Zealand, which was originally intended to increase the efficiency of gasoline. This consists essentially of an aluminum pot in which is set a nest of stationary thin curved plates, radiating from a central core. The lower edges of the plates are in contact with the pot, to which heat is applied. The fuel leaves a standard carburetor, passes through the pot where it is converted into a dry gas before passing into the cylinders of the engine.

Birmingham Jewelers Hear Chamberlain

Sir Austen Chamberlain, Foreign Minister of Great Britain, delivered an address on disarmament before the dinner of the Birmingham Jewelers' Association of England on January 26, 1929. Another distinguished guest at this event was Alanson B. Houghton, American Ambassador to Great Britain.

Aluminum Goods Manufacturing Company

The Aluminum Goods Manufacturing Company, Manitoc, Wis., recently awarded contracts for the construction of a new seven story addition to its plant No. 2, in Monitowoc, and the work is already well under way. The building is to be used for office and warehouse space.

New Incorporations

Aldeen Manufacturing Company, 426 South Main Street, Rockford, Ill.; capital, $100,000; to manufacture tools and metal stampings; by Thorsten Erickson, Reuben Aldeen and E. B. Erickson.

United States Brass Corporation, Cleveland, Ohio; capital, $25,000; to manufacture and cast non-ferrous metals; by R. R. Ivone, president and general manager; B. T. Ruby, secretary; Rudy Mill, treasurer. Plant established at 1276 East 55th Street, Cleveland.

Art Metalable Corporation, York, Pa.; organized in latter part of 1928; to manufacture gummed metal seals, labels, etc., by a variety of processes, including embossing, etching and engraving; straight-line production has been instituted in plant; complete art department is maintained, as well as tool and die departments, stamping rooms. A sales office was recently opened at 11 West 42nd Street, New York City.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

FEBRUARY 1, 1929.

All last year's officers and directors of the **Chase Companies, Inc.**, were re-elected at the annual stockholders' and directors' meetings last month. The officers are: President, Frederick S. Chase; vice-president, Irving H. Chase; secretary, Robert L. Coe; treasurer, Richard D. Ely; assistant secretary and general counsel, Charles E. Hart. The directors are: F. S. Chase, I. H. Chase, Arthur R. Kimball, R. D. Ely, R. L. Coe, Fred Jackle, Rodney Chase and J. R. Van Brunt.

Edward H. Davis of the **Scovill Manufacturing Company**, representing the metal button manufacturers of this city, appeared before the ways and means committee of the House of Representatives last month to ask for greater tariff protection against importations of dress trimmings and buttons. They are now being brought in, he said, at about half the domestic production costs. He asked also that no distinction be made between embossed and non-embossed buttons and that there be an increase to three and one-half cents per gross.

Arthur A. Tanner, formerly president of the company, was made chairman of the board of directors at the annual meeting of the **Lux Clock Company** last month. The other officers elected are: President, Henry Weyand; vice-presidents, A. H. Hauser and Herman J. Weisman; treasurer, Paul Lux; secretary, H. A. Soper; assistant treasurer, Fred Lux; assistant secretary, Herman Lux.

All local plants are operating at capacity and in several departments are working overtime, according to the monthly report of the United States Employment Service. It states skilled labor is at a premium but that there is a surplus of unskilled labor.

Mrs. Angeline Buccini, widow of Allesandor Buccini, who died as the result of injuries received while at work for the **Scovill Manufacturing Company**, has been awarded compensation amounting to $3,106 and in addition, $200 funeral expenses.

Edward O. Goss, president of the **Scovill Manufacturing Company**, was again elected president of the Citizens and Manufacturers National Bank at the annual meeting last month. **Bennet Bronson** and **John H. Goss**, vice-presidents, and **Leavenworth P. Sperry**, secretary of the Scovill Company, were elected directors of the bank. **F. S. Chase**, president of the **Chase Companies, Inc.**, was re-elected a director of the **Waterbury National bank.**

John H. Goss, vice-president of the **Scovill Manufacturing Company**, as a member of the Bridgeport ordnance district under the Ordnance department of the United States government, attended a gathering of government ordnance experts in Hartford last month to hear a discussion by **Col. Tracy Dickson** on the application of a 200,000 volt X-ray for revealing defects in metals. Talks were also given on developments in metals and metal workings by the ordnance department of the army. The Bridgeport district is one of 14 districts set up by the national government as a step in the decentralization of the procurement of war munitions and in the interest of preparing industry for a national emergency. Others who attended the gathering were **W. R. Webster**, vice-president of the **Bridgeport Brass Company; C. R. Burt**, vice-president of **Pratt and Whitney Company** of Hartford; **S. M. Stone**, president of **Colt's Fire Arms Company** of Hartford; **P. B. Gale**, president of the **Hartford Machine Screw Company**, and **Edwin Pugsley**, superintendent of the **Winchester Arms Company** of New Haven.

Eben L. Lewis was elected president of the **Bristol Company Foremen's Association** at the annual meeting last month. Other officers elected are: Vice-president, **D. F. Behlman**; recording secretary, **Walter Davis**; financial secretary, **Edward Quinn**; treasurer, **George Petitjean.**

The local Chamber of Commerce reports the following new industries that located in Waterbury during the past year: Eyelet Specialty Company, Keeler and Long Company, Waterbury Engraving Company and the following expansions: American Fastener Company, Bristol Company, Beardsley and Wolcott Manufacturing Company, Waterbury Buckle Company, French Manufacturing Company, Waterbury Farrel Foundry and Machine Company and Waterbury Steel Ball Company.

Patents were granted to local inventors during the past month as follows: **Walter Abel**, assignor to the Patent Button Company, stick pin; **Philip Reutter**, assignor to the Scoville Manufacturing Company, perfume bottle holder; **George Anderson**, assignor to the Scovill Manufacturing Company, lip stick holder; **Morris H. Bennett**, assignor to the Scovill Manufacturing Company, condenser; **Paul Fenton**, assignor to the Scovill Manufacturing Company, floating trim stud; **Henry Wild**, assignor to the Scovill Manufacturing Company, lip stick container. Trade mark registrations were granted to the Beardsley & Wolcott Manufacturing Company for electric curling irons, and electric cigar lighters; **Beardsley and Wolcott Manufacturing Company** for an electric heating device and to the **Chase Brass and Copper Company** for a whistle. —W. R. B.

Bridgeport, Conn.

FEBRUARY 1, 1929.

Litigation over the right to make the "spring bar bumper" for automobiles, the basic patent for which is claimed by the **American Chain Company** of this city, now involves another local concern, the **Stewart-Warner Speedometer Company**. The former company has sued in the Federal district court of New York asking an injunction against the latter company and Judge Thatcher has granted it. A hearing is now to be held on whether the injunction shall be temporary or permanent.

The Bullard Machine Tool Company has been making tests of a new cutting metal called "Widia," licensed under German patents, which cuts through steel at the rate of 230 feet a minute or through cast iron at 600 feet a minute. It is an alloy of tungsten, carbide and cobalt and is manufactured here under the name of "carboloy" and American manufacturers have agreed to sell it at not less than $500 a pound, the price in Germany. **E. P. Bullard**, president of the company, indicates that it may be necessary to remodel some of the company's high speed machinery as a result of the tests.

Byron Fones, receiver for the **Connecticut Electric Company** of Meriden, has brought suit against the **American Specialty Company** of Bridgeport, in the United States District court, claiming infringement of a patent for an electric switch. A permanent injunction is asked, an accounting of profits and an award of damages.

The Armstrong Manufacturing Company has petitioned the Treasury department to conduct an inquiry into the "dumping" of pipe-threading dies from Germany in competition with Connecticut tool manufacturers. It claims it understands that 20,000 sets of German-made imitations of Armstrong adjustable stocks and dies for threading pipes are in transit from Germany to a New York importer with whom dealers have placed orders to buy at $3.25 per set. The extreme jobbers' price on these products as manufactured here is $5.40 and even in Germany these products sell for $4.77 per set. The Treasury department is asked to have the goods held in New York long enough to make a proper investigation.

Harry G. Specht, general works manager of the **Bassick Company**, has left that company to associate himself with a group of New York bankers who have been buying up various factories throughout the country. He was active in consolidating the Bassick plants in Newark and Meriden with the plants in this city and in the purchase of the former **Columbia Graphophone Company** plant for the Bassick Company.

The Bullard Machine Tool Company stockholders have voted to change the name of the company to the **Bullard Company** and to change the capitalization from 92,000 shares to 300,000

shares. Of this, 270,000 shares will be exchanged for the old outstanding shares and the balance sold.

The Federal Employment Service reports concerning Bridgeport: "Industrial employment conditions continue at a high level. All plants are operating at capacity with overtime schedules in effect in many. A shortage of highly skilled specialists exists in the metal trades."

Directors of the **Bryant and Chapman Company** declared a quarterly dividend of 65 cents a share, payable January 2.

—W. R. B.

Connecticut Notes

FEBRUARY 1, 1929.

NEW BRITAIN.—Local hardware manufacturing companies during 1928 paid out in cash dividends about $7,128,591. The **American Hardware Company** paid out $2,560,000 at the rate of 16 per cent regular and 4 per cent extra; **Landers, Frary and Clark** paid out $1,680,000, at the rate of 12 per cent regular and 4 per cent extra; **Stanley Works** paid out $1,352,000 on the common and $210,000 on the preferred; **Fafnir Bearing Company** paid out $600,000; **North & Judd Company** paid out $250,000; **Hart and Cooley** paid out $350,000; the **Union Manufacturing Company** $60,000; the **New Britain Machine Company,** $29,684 on the common and $79,240; **Beaton and Caldwell,** $17,667.

This year's grand list shows assessment of the local leading industries as follows: **American Hardware Corporation,** $11,729,725; **Stanley Works,** $8,191,575; **Landers, Frary and Clark,** $6,713,675; **North and Judd Manufacturing Company,** $2,262,400.

Stockholders of the **Hart and Hutchinson Company** have voted to increase its capital stock from $300,000 to $1,000,000. The company is owned by interests identified with **Hart and Cooley** and the **Fafnir Bearing Company.**

Directors of the **New Britain Machine Company** have declared a dividend of 37½ cents a share on the common. This is the first payment on the common since 1920 and is expected to reestablish the company on the $1.50 basis as formerly.

The Union Manufacturing Company directors have declared the regular quarterly dividend of 37½ cents a share.

David G. Ong, formerly divisional sales manager of the **Landers, Frary and Clark Company,** has been chosen president of the **United States Leather Company.**

The North & Judd Manufacturing Company received the largest federal tax refund of any company in the state last month, its refund amounting to $244,000. **The Stanley Works** received a refund of $12,952.

Unconfirmed reports have been received to the effect that the **William Highton and Sons Company** of Nashua, N. H., has merged with the **Hart and Cooley Company** of this city. The former company manufactures heating rolls and registers.

BRISTOL.—E. Ingraham and Company, clock manufacturers, have awarded the contract for the erection of a five story factory addition, 50 x 150 feet to the **Torrington Building Company.**

DeWitt Page, president of the **New Departure Company,** predicts an unusually good business year for 1929, and says he believes more people will be employed in the city than ever before. **Fuller F. Barnes,** president of the **Wallace Barnes Company,** states that conditions indicate a continuance of favorable business conditions. **Charles Riley,** general manager of the **Horton Manufacturing Company,** expects employment locally to maintain its present high level with the probability of a slight increase. **W. Kenneth Sessions,** president of the **Sessions Clock Company** thinks conditions look very favorable and states that the company had a good fall and early winter trade. **Dudley S. Ingraham,** vice-president of the **E. Ingraham Company,** describes present conditions as unusually good and expects his plant to continue on a full time basis during the coming year.

The Federal Employment Service reports for Bristol, "a shortage of skilled workers in the metal trades with many departments working overtime."

The Sessions Foundry Company has received a federal tax refund amounting to $94,382.

TORRINGTON.—The Turner and Seymour Manufacturing Company has filed a complaint with the Interstate Commerce Commission that the rates charged by the New Haven railroad for transportation on molding sand are too high. A decrease of 3½ cents per 100 pounds in the freight rates on this commodity is asked by the local concern.

The Federal Employment Service reports for Torrington, labor supply and demand well balanced. All plants are operating at capacity.

The Hendey Machine Company of this city has received a federal tax refund amounting to $69,860.

WINSTED.—Officers of the **Strand and Sweet Manufacturing Company** were elected last month as follows: President, **Edward P. Jones;** vice-president, **Robert E. Gaylord;** secretary and treasurer, **Hadleigh H. Howd;** general manager, **Walter V. Davey;** directors, the above, and **Olaf Isachsen, William H. Phelps** and **Dudley H. Manchester.**

Ralph E. Strand, who recently organized the **Strand Enamel Company,** has leased the buildings of the **Franklin Moore Company,** which have been idle for a year, and plans to start operations at once. In addition to enamel work he plans to manufacture wire drawing machinery and machines for enameling wire. Capital stock will be $100,000 but there will be no sale of stock.

Luman C. Colt, local manufacturer, celebrated his 80th birthday last month. He has been with the **Strong Manufacturing Company,** of which he is a director, more than 50 years.

The Capitol Knife Company will be dissolved and the **Capitol Products Company** organized in its place, carrying on the business of the former company, and in addition manufacturing electric heaters and toasters. John Colavecchio, Joseph Diasi and Joseph Frazioli, principal owners of the former company, will be in charge of the new concern.

J. A. Norton, of this city, representing the wood chisel industry, appeared before the ways and means committee of Congress last month asking that the duties on chisels, gouges, and drawing knives for woodwork be 28 cents each and 60 per cent ad valorem.

HARTFORD.—The Pratt and Whitney Company has put on a night force of 100 men and expects to continue it indefinitely. It now has 1,900 on its payroll. **The Pratt and Whitney Aircraft Company** now is employing 125 men on its night shift and expects to increase it to 200 within the present month.

BANTAM.—A special meeting of the stockholders of the **Trumbull Vanderpoel Electric Manufacturing Company,** has been called to ratify the sale of the company to **Cutler-Hammer, Inc.,** of Milwaukee, Wis. Shares of preferred stock in the latter concern will be distributed to the holders of preferred stock of the former company and holders of shares of common and preferred of the former company will also receive certain sums in cash. The company manufactures sockets, electrical switches and panels. The officers are: President, **J. J. Noll;** treasurer, **F. L. Vanderpoel;** secretary, **W. D. Plume;** manager, **R. V. Leavitt.**

THOMASTON.—The directors of the **Seth Thomas Clock Company** have declared the regular quarterly dividend of 25 cents a share on the common stock.

SOUTHINGTON.—Operations have been resumed at the **H. D. Smith Company,** with many of the former employes at work. In addition to the manufacture of the regular small tool line previously handled, the company is making special forgings. The old company went into bankruptcy about a year ago but has been reorganized.

—W. R. B.

Middle Atlantic States

Newark, N. J.

FEBRUARY 1, 1929.

Directors of the **Art Metal Works, Inc.,** 7 Mulberry Street, have approved a plan for readjustment of the company's capital structure to provide for future expansion. **A. C. Allen,** vice president of the **United Cigar Stores Company,** has been elected a director of the Art Metal Works. The readjustment plan calls for an increase of the authorized common stock from 150,000 to 500,000 shares of which 225,000 shares will be outstanding. A total of 165,000 shares of new common will

be exchanged for the 110,000 shares now outstanding. All of the outstanding convertible preference stock has been called for redemption at $35 per share May 1. It is expected that all this stock will be converted into common before April 26. **Louis V. Aronson**, president, announces the declaration of dividend of 60 cents a share on the new common stock payable February 1 to stock of record January 15. The company has a contract for many supplies for the United Cigar Stores Company.

The Sunlight Lamp Company, manufacturers of radio tubes, has leased 10,000 square feet in the factory at 76-82 Colt Street, Irvington. The new plant is being equipped with the latest type of automatic machinery and will have a manufacturing capacity of 15,000 radio vacuum tubes daily. The machines are now being installed and production will be in full swing in a short time. The company's other factory at 288 Springfield Avenue, Newark, is very busy. Production in this plant will continue, giving the company a total daily output of 22,000.

Forty-two thousand shares of the **Northern Manufacturing Company**, 371 Ogden Street, Newark, makers of radio tubes, which is redeemable next December, is being offered for sale. After reaching the present rate of production of radio tubes in July of last year, net profits are reported for the five months ending November 30, 1928, $105,495. This is nearly three times the entire annual cumulative dividend on the present issue of preference stock. The company has on its books orders for 500,000 tubes.

Taking over the management of the **Splitdorf-Bethlehem Electrical Company**, of 392 Hugh Street, Newark, by the **Thomas A. Edison Corporation** of West Orange, has been announced following a meeting of the Splitdorf directors. This meeting, held in the company's offices in New York, approved an agreement fixing the terms of the new relationship and elected a new board. The announcement stated that under the new management Edison men will become officers of the Splitdorf-Bethlehem Company under **Charles Edison**, who will be the new president.

The following Newark concerns have been incorporated: **E. J. Brooks Company**, $200,000, manufacture metal goods. **Tung Sol Radio Tubes, Inc.**, 2,000 shares no par, radio tubes. **Metalcraft Engineering Corporation**, $300,000 preferred and 7,000 shares common no par, manufacture metal products. **Pioneer Iron Works, Inc.**, $100,000, manufacture metals. **Collway Radio Laboratories, Inc.**, 1,000 shares no par, manufacture radio parts. —C. A. L.

Trenton, N. J.

FEBRUARY 1, 1929.

Trenton metal plants report that business is showing some improvement over last year and better conditions are now looked for. The **Jordan L. Mott Company** has resumed operations after having been closed down for the taking of the annual inventory. The company is said to have many large orders on hand and expects to be kept busy during the spring and summer months.

By an amended certificate of incorporation filed with the Secretary of State at Trenton, the capital stock of the **American Smelting and Refining Company** was increased to 500,000 shares of 7 per cent preferred at $100 par; 200,000 shares of 6 per cent second preferred at the same par and 400,000 shares of common stock without stated par. The former authorized capital was $115,000,000. For the filing of the certificate the state collected a fee of $31,000.

Hiram W. McGrath, recently appointed manager of the **Trenton Division** of the **Keystone Automobile Club**, was formerly assistant sales manager of the **Imperial Type Metal Company** of New York. He is a graduate of Mount Union College, Alliance, Ohio.

The Crescent Insulated Wire and Cable Company, Trenton, announces a redemption of bonds to the amount of $25,000. The same concern received a refund of taxes from the United States Treasury Department amounting to $5,223.

Phoenix Brass Fittings Corporation, Irvington, N. J., has been incorporated here with $500,000 preferred stock and $1,000,000 common stock to manufacture brass fittings.

H. V. Wodtke, general manager of the **Standard Underground Cable Company**, announces that the manufacture of cables will be discontinued at the Pitts plant of the company and that these operations will be moved to Perth Amboy and St. Louis plants. The general offices of the company will remain at Pittsburgh. The **General Cable Company**, of which the Standard plant is a part, purchased a tract having a 600 foot frontage on Staten Island Sound from the **Perth Amboy Dry Dock Company** a short time ago. This property adjoins the present plant and will make possible facilities for water transportation. —C. A. L.

Middle Western States

Detroit, Mich.

FEBRUARY 1, 1929.

The Pontiac Plating Company recently became a corporation. It is located at Scott Lake road and the Dixie Highway, Pontiac, Mich. Its capital stock is $10,000. General plating work will be done. The stockholders are **A. F. McCrea, Arthur O. Roberts and Kenneth D. McGregor.**

The Chevrolet Motor Company has started construction of the new addition to its grey iron foundry at Saginaw, Mich., announces **Arnold Lenz**, general manager.

The United Brass and Aluminum Manufacturing Company at Port Huron, Mich. has 15 per cent more orders on hand at present than a year ago, it is announced. Prospects for new business during the first and second quarters of the year are good. During this period the company will be in the market for brass and aluminum.

The American Injector Company, Detroit, reports orders ahead for a considerable period, with the outlook favorable for new business. During the next few months the company will be in the market for lead, aluminum, brass castings, zinc and copper.

The Grand Rapids Brass Company, Grand Rapids, Mich., now has 288 workers on its payroll as compared with 271 in January a year ago. It reports favorable prospects for new business during the present year. The company will be in the market for lead, brass, aluminum, brass castings and zinc.

The Mueller Brass Company reports 882 employes at present as compared with 811 a year ago. Orders ahead total $1,184,000, it is announced. Prospects for new business during the first half of 1929 are considered good. During this period the company will be in the market for lead, brass, aluminum, zinc, copper and scrap metals, it is stated.

Pontiac Die and Tool Machine Company reports about the same number of orders ahead as at this time a year ago, with good prospects for new 1929 business.

The Wilson Foundry and Machine Company, Pontiac, Mich., reports 3,200 employes at present, while orders ahead, compared with January, 1928, show an increase of approximately 30 per cent. This company is preparing for the largest business in its history. During the first half of the year it will be in the market for bronze bearings, aluminum, brass castings and non-ferrous scrap metal, it is stated.

A foundry unit of six new buildings with a total floor space of 200,000 square feet is under construction at Pontiac, Mich., as the latest addition to the immense factory of the **Oakland Motor Car Company.** Included in the buildings are a foundry proper, a core building, a cupola building, sand storage building and a cleaning and service building. Plans also call for the installation of several miles of conveyors, electric trucks traveling on overhead mono-rails, pneumatic equipment and other modern labor saving devices that will permit a daily pouring capacity of 450 tons of castings with a foundry personnel of only 700 men. When the new foundry is placed in operation in February a further manufacturing economy will have been effected through the centralization of operations and the elimination of interplant operations.

The Campbell, Wyant and Cannon Foundry Company, Muskegon, reports 1,600 employes at present, compared with 1,200 a year ago. A much heavier output is expected during the next six months. Announcement also is made that Ira

A. Wyant, secretary and treasurer, has obtained a 99-year lease on some downtown Muskegon property and will erect a $500,000 store and office building.

Announcement is made that the **Long Manufacturing Company**, Detroit, manufacturers of motor car radiators and clutches, has been purchased by the **Borg-Warner Corporation** of Chicago, manufacturers of automobile parts. The transaction was for cash, it is said. Sales of the Long organization in 1928 totaled $7,600,000, it is stated, and net earnings were approximately $800,000 after all charges, including taxes and depreciation. The Detroit plant has 175,000 square feet of floor space.

The **American Brass and Iron Company**, Detroit, reports 100 per cent increase in orders over a year ago.

The **Bundy Tubing Company**, Detroit, has, it is announced, 25 per cent more orders on hand at present than a year ago, and is looking forward to 25 per cent to 50 per cent increase in business during the next six months. In this period the company will be in the market for strip brass, strip copper, screw machine parts, solder and acids.

The **Duplex Printing Press Company**, Battle Creek, report they will be in the market for non-ferrous scrap metal, and new brass during the first part of 1929. The company has about the same number of orders on hand at present as a year ago, and prospects for new business are considered very favorable.

Baldwin **Abrasives** is the name of a concern recently incorporated at Pontiac, Mich. It has a capital stock of $10,000.

The **Detroit Lubricator Company** is now employing 1,333 workers, as compared with 1,203 a year ago. Orders on hand are reported approximately the same as a year ago, with prospects good for new business during the first and second quarters of 1929. In this period the company will be in the market for lead, brass, copper, and non-ferrous scrap metals.

The **Penberthy Injector Company** now has 193 employes at present, as compared with 176 a year ago. Orders on hand are reported as being about the same as at the beginning of 1928, with prospects fair for new business during the first and second quarters. —F. J. H.

Toledo, Ohio

FEBRUARY 1, 1929.

The non-ferrous metal plants in Toledo and environs already are beginning to show more activity on mid-winter production. The city has such a wide range of plants, it is seldom that some of them are not operating more or less extensively. The plating industry is holding up quite satisfactorily.

Toledo platers are planning to support Detroit in every way possible in making plans for the coming national convention in that city. It will be a big gathering—in fact, the greatest the organization has ever held. The Detroiters are deeply engrossed in plans, and that means, of course, it will be a success in every way. —F. J. H.

Cleveland, Ohio

FEBRUARY 1, 1929.

Business in this area, particularly in the brass, copper and aluminum industry, is gradually assuming more favorable proportions. Most of the plants, no matter what their line may be are becoming more and more busy as mid-winter weeks advance.

Establishment of a plant in Canton, O., for the manufacture of airplanes was a step nearer realization during the last two weeks, with the announcement by the new industries committee of the Chamber of Commerce that a group of men had inspected Canton in a search for a site. Although details are lacking, it is believed that among other sites the visitors inspected the plant of the Dueber Hampden Watch Works, which has been unused for nearly two years.

A new low-priced six-cylinder car is attracting considerable attention at the automobile shows. It is entirely the product of the present Peerless management, which took command at the big Cleveland factory something less than a year ago. In order to make the price possible, the Peerless factory was enlarged for bigger production and the most advanced system of economical straight-line production installed, it is stated. —F. J. H.

Chicago, Ill.

FEBRUARY 1, 1929.

The Dallas Brass and Copper Company has changed its name to the **Intermediate Brass Company.**

The Eskholme Metal Products Corporation has been incorporated in Chicago with a capital of $20,000. The company will manufacture and deal in metal products. Signers of the articles of incorporation are **T. G. Cooke, Winona Cooke** and **Walter A. Jordan.**

Crown Metal Products has recently been incorporated in Chicago. Signers of the articles of incorporation are **Charles A. Urban, O. E. Geppert** and **E. C. Tourje.** —A. P. N.

Wisconsin Notes

FEBRUARY 1, 1929.

Statistics show that electroplating industry in Milwaukee enjoyed an increase in 1928 over 1927. In both years there were seven concerns engaged in the business in the city, but the number employed in 1928 increased from 90 to 108. The amount paid in wages increased likewise, there being $137,317 paid in 1927 as compared to $178,818 in 1928.

The amount of capital employed showed a drop, a total of $221,340 being employed in 1927 as compared with $217,673 in 1928. The value of the product showed an increase, however, it being rated at $310,339 in 1927 as compared to $380,778 in 1928.

The stamped and enameled goods industry in the city also showed a steady increase. The number of firms engaged in this business remained the same, there being nine engaged both years. The number of employees increased however, from 2,713 in 1927 to 2,844 in 1928. Wages paid increased accordingly, $3,541,283 being spent in 1927 as compared with $3,674,404 in 1928.

Amount of capital employed also showed an increase, it being placed at $7,213,880 in 1927 as compared with $7,240,034 in 1928. The value of the product increased from $9,926,747 in 1927 to $11,618,388 in 1928. Export business also took a decided jump, it being valued at $72,000 in 1928 as compared to $31,788 in 1927.

J. E. Burke, manufacturer of metal weather strips, metal radiator cabinets and humidifiers, Fond du Lac, Wis., has announced plans for the development of 25 branch sales offices in cities in every section of the United States before June 1. The company now maintains branch offices at Chicago, Milwaukee, Minneapolis, and Kansas City. Other branches are to be established at Syracuse and Buffalo in New York state and at Detroit, Cleveland and Boston within a short time. Because of the large volume of orders with which the company is starting this year and the extensive expansion program under way, it will be necessary to enlarge the Fond du Lac plant and add to its equipment during the year, Mr. Burke said. He indicated that changes and additions to be made at the plant this year will be extensive.

The West Bend Aluminum Company, West Bend, Wis., presented bonus checks at Christmas to 497 employees totaling $32,697. Before presenting the checks, B. C. Ziegler, president of the company, made a brief address before the employees.

The plant of the **Milwaukee Stamping Company** has become one of the leading manufacturing industries in Milwaukee. The company is engaged in a general stamping business, and also specializes in high-class finishing work including nickel and brass plating. **Edwin B. Bartlett**, president of the company, states that the concern expects to enjoy continued good business throughout 1929.

Approximately 2,500 employees of the **Aluminum Goods Manufacturing Company**, operating plants at Manitowoc and Two Rivers, Wis., were presented with bonus checks on January 12. The total amounted to $150,000 and the share of each employee represented 4 per cent of the compensation received during the year from the company. The bonus is in addition to the Christmas checks distributed by the Goods company which on that occasion dispersed some $25,000 in cash to its employees, representing a gift from the concern for Christmas in form of the equivalent of two days' pay to each employee. —A. P. N.

Other Countries

Birmingham, England

JANUARY 18, 1929.

Purchasing of metals improved decidedly at the end of the old year following the sharp upward movement in rolled copper. In Birmingham the price of this material is now £100 per ton and it is believed that firm prices will be maintained during the coming months. Better business in brass and copper tubes has brought a rise of ¼d per lb. in these materials. The Birmingham brass trade has been fairly well employed through most of the year, and it is estimated that the turnover will probably be better than the previous twelve months.

The electrical industry has found new uses for copper and brass, and the kindred trade of wireless has made rapid expansion during the last few years. The large schemes for the electrification of England as well as the increasing use of electricity on the railways, portends a bright future for electrical engineering which consumes a tremendous amount of non-ferrous material. The manufacturers of brass and copper tubes still have to face severe foreign competition both at home and abroad, but they have been more successful in securing business in England.

In plumbers' brassfoundry the demand was reduced owing to less pressure upon house builders. In the export trade producers found themselves up against the problem of native manufacture in Australia and New Zealand, for nearly all the brass fittings needed are now being made on the spot. A similar state of things applies to South American trade, and in this market also there is to be found the dumping of cheap materials from European countries.

Electroplate manufacturers find that South America is an improving market for their goods, but Central America takes only a small quantity. Australia has ventured on the making of electroplate in her own country, but manufacturers there are finding that the art which has taken many years to learn in Birmingham cannot be mastered all at once, and the result has been some useful orders for superior grades of electroplate from the English factories. Silver as an article of tableware still holds a strong position and silversmiths have had a fair share of trade during the year. The jewelry trade has had a busy time during the last three months supplying the shops throughout the country. While there is still a tendency to spend money on such pleasures as motor cars and wireless, a great deal of ornamental jewelry is purchased around the Christmas season and there is reason to believe that this year the volume of business showed a marked improvement on the past few anniversaries.

A good deal of interest is being taken in the merger of the **International Nickel Company of Canada, Ltd.,** and the **Mond Nickel Company, Ltd.** A provisional agreement has been signed, and the shareholders of the Mond Nickel Company, Ltd., have received a personal letter from the **Chairman Lord Melchett** supporting the proposals and stating that "he was satisfied that far reaching economies could be achieved by such a fusion."

It is proposed to introduce legislation to safeguard the trade descriptions and designations obtaining in the jewelry industry. The trade agreed long since upon certain markings such as "rolled gold" in order to safeguard the purchaser from buying articles exposed for sale under false descriptions. A Bill was introduced in 1924 but for various reasons its passage through the House of Commons has been postponed. But a recent question in the House put to the President of the Board of Trade by a Birmingham member has revived the agitation, and it is hoped that before long such a measure will become law.

—J. H.

Business Items—Verified

Indiana Smelting and Refining Company, 1116 East 16th Street, Indianapolis, Ind., has moved into a new plant. No further building is contemplated at present.

The Mine and Smelter Supply Company announces that beginning February 15, 1929, its general offices will be at Denver, Colorado, where all correspondence should then be directed.

Meaker Company, 1249 Fulton Market, Chicago, Ill., will build a new one and two story plant to cost $65,000 with equipment. Company manufactures galvanizing and electroplating equipment, etc.

The Cloyes Gear Works, East Cleveland, Ohio, has placed a contract for a complete dust-arrester system for the polishing and grinding shops. The contract was awarded to **Northern Blower Company,** Cleveland, O.

Gluntz Brass Foundry Company, 3301 East 45th Street, Cleveland, Ohio, plans construction of a one-story plant to cost $70,000 with equipment. Company casts brass, bronze, aluminum and other metals and operates a brass machine shop.

Autorad Electrical Corporation, Adrian, Mich., makers of radio receiving sets, plans expansion of output, for which new space is being added. The company has been doing assembly work largely but expects to manufacture more of its parts in the near future.

The Brown Instrument Company, Philadelphia, Pa., announces that due to its increased business in New York and vicinity it has secured larger quarters for its New York office at 117 Liberty Street, New York City. **M. M. Watkins** is district manager.

The Atlas-Ansonia Company has been formed by merger of **The Atlas Manufacturing Company,** New Haven, Conn., and **The Ansonia Novelty Company,** Ansonia, Conn. The combined companies will operate a modern plant at 54 Grant Street, New Haven.

The C. F. Pease Company, Chicago, Ill., states that due to rapidly expanding distribution requirements, a new Pacific Coast sales office has been established at 501 South Spring Street, Los Angeles, Cal., under the direction of Ralph S. Gibson, western sales manager, who will devote his entire attention to sales in that territory. The company manufactures blue print machinery and supplies, drafting room materials, etc.

T. E. Conklin Brass and Copper Company, 113-115 Leonard Street, New York City, has taken a long term lease on a building at that address for its general sales offices, and will use its entire building at 54 Lafayette Street as a warehouse and shipping department.

Willimantic Metal Screen Company, Inc., Willimantic, Conn., recently organized, has secured a factory and is now completing installation of machinery for production of 2,500 screens per day. The product will be an easily assembled screen, which will be produced in sizes graded by quarter inches, the company states.

The Forest City Foundry, Cleveland, Ohio, has recently installed a dust collecting system to supply pure air in the sandblast rooms and tumbling barrel shop. There is also a very complete ventilating system for the core-oven department. The collector units, etc., were manufactured by **Northern Blower Company,** also of Cleveland.

Kennedy Machine and Brass Company, Dallas, Texas, operated by W. D. Kennedy, has acquired new land and a building where a new factory will be established at cost of about $200,000. The company operates non-ferrous foundry, iron foundry, casting, cutting, stamping, machining, plating, polishing, lacquering and other departments.

Robert Mitchell Company, Montreal, Que., brass and iron founders and manufacturers of metal goods, plans to expand production. A new foundry for brass and bronze will be put up, together with research offices and laboratories. One million square feet of land at St. Laurent has been purchased. The plant at Belair Avenue will continue in operation.

The Republic Brass Company, Cleveland, Ohio, has just completed what is stated to be one of the most modern and complete fume and dust removal systems of its kind in the country. This system takes care of the entire chromium plating, polishing, buffing and grinding department, and consists of "Norblo" ventilating and dust collecting units manufactured by **Northern Blower Company,** Cleveland, Ohio.

Review of the Wrought Metal Business

By J. J. WHITEHEAD
President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

FEBRUARY 1, 1929.

Advancing prices and continued activity in the brass and copper business prevailed in the first month of the new year. New orders were plentiful and when added to the heavy volume carried over from last year, placed the mills in a very comfortable position. There have been some expressions of doubt as to whether the relatively high prices now prevailing would encourage further commitments on the part of buyers. It is felt by some factors that these prices may make for a tendency to substitute other metals for brass and copper, but as yet there is no sign that this is being done. There is probably some level of prices at which some articles would suffer because of the high price of raw materials and some conservative folks in the industry are beginning to get a trifle anxious about the matter. Up to this time, however, it appears that brass and copper have become so firmly intrenched in such a wide variety of industries, that a very radical change in policy or a really extortionate price level would be necessary to dislodge them. New building permits are being issued on a larger scale than ever before and brass, copper and Monel metal are being specified very freely.

During January some large contracts for Monel metal were placed by manufacturers of laundry and refrigerating machines. The outlook in this branch of the non-ferrous metal industry seems to be brighter than ever. The mills producing Monel metal are running full in all departments with delivery dates now scheduled for about six weeks. This is the first time that so long a period has been required to get a shipment from the mills. The demand for nickel is so enormous that deliveries are extremely difficult to get. Special sizes of nickel sheets and rods and tubes are quoted for delivery in about three months. Manufacturers of radio tubes are finding it about impossible to secure sufficient nickel, wire and strip to keep going and are seriously handicapped in trying to keep up with the demand for tubes in which nickel is an essential part.

So long as the country continues prosperous, this condition will probably prevail and if the demand for metals continues to increase, it is evident that additional production facilities will be needed. Some new mills are now under construction and others are being planned. The owners are predicting that the added facilities will be completely engaged as soon as ready.

Metal Market Review

By R. J. HOUSTON,
D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Copper

FEBRUARY 1, 1929.

Further strength was developed in copper during January. Events since the beginning of the year have furnished striking evidence that domestic and foreign trade demand are being maintained on a huge scale. A steady market uptrend has continued for many months as the result of the tremendous flow of the metal into consumption. There has been no significant price recession for more than a year, and the present level of 17 cents per pound, delivered to Connecticut Valley points, is the highest since April, 1923.

Large sales for export were effected last month on the basis of 17¼ cents c.i.f. European ports. A good demand developed for home account also notwithstanding previous heavy transactions. The situation in the distribution field is therefore particularly favorable for broad movements from producer to consumer. American production of refined copper in 1928 amounted to 3,255,698,000 pounds. Total deliveries last year were 3,315,362,000 pounds, or 59,664,000 pounds more than output. Interesting history was made in 1928, and the year proved to be the best ever known both in point of output and demand. Market conditions were also the healthiest and strongest in years. The whole complexion of the copper situation is consequently different from what it was in past lean years. The industry is now operated for profitable results. Excessive production and selling at near or below cost are now considered as economic blunders. In the abstract such methods are unsound, and in practice they spell loss and economic disturbance. The copper industry has demonstrated its ability to break away from old traditions which were serious handicaps to its prosperity. The present momentum in world demand seems assured for 1929 plus still greater expansion as big electrification programs and other important projects become effective. All data and developments reveal the strength of the situation. Prospects are consequently bright for even larger consumption of copper in the coming months. Further strength developed on February 1, and on that date the domestic price was advanced to 17¼ cents delivered to Connecticut Valley points. The export price is expected to be lifted to 17½ cents c.i.f. European ports. Demand is heavy and increasing for both home and foreign account.

Zinc

Steadiness was the conspicuous market feature throughout the entire month of January. There was a fair amount of demand, but the buying was not aggressive enough to create any display of enthusiasm among consumers. Prime Western is quotable at 6.70c New York and 6.35c East St. Louis. There were reports of occasional concessions from these prices, but to outward appearances sellers were not inclined to spoil the outlook by much shading of current quotations. Consumption of zinc is good, and with expectations of improvement in the ore situation new strength should develop in the market for slab zinc. Stocks in smelters' hands at the end of December were 45,441 tons, being a decrease for the month of 1,101 tons. They compare with 40,751 tons at the end of 1927 and 21,887 tons at the end of 1926. Production in this country during 1928 amounted to 619,595 tons of slab zinc. Deliveries last year were 614,878 tons. Total world production for 1928 was 1,563,324 tons, against 1,415,049 tons in 1927. Recent sales were in larger volume, and market showed a firm tone.

Tin

Throughout the past month tin had periods of both brisk activity and of pronounced dullness. There were also alternate developments of weakness and strength, but without the violent price movements which have hitherto been typical of the tin market. At the beginning of January spot Straits sold at 49⅞c, and for the first half of the month it was difficult to force the Straits quotation below 49 cents. Lately, however, the price situation presented a rather mixed picture. The tone developed an easier tendency near the month-end and Straits was quoted at 48½c for both prompt and future deliveries. There was good consuming demand especially when the price level furnished the stimulus to place orders. A large tonnage is going into consumption. Operations at American tin plate plants have been on a large scale, with prospects of record activity for the first quarter of this year. Recent supplies have been in excess of demand. Stocks of tin abroad are also large, and their rapid growth has occasioned much comment and speculation as to the final outcome of the program to control a heavy proportion of the visible supplies. Speculative trading in local circles was in substantial volume. World consumption of tin in 1928 was estimated at 152,619 tons, against 138,780 tons in 1927, an increase of 13,839 tons. American tin deliveries in January reached the high total of 8,795 tons. The market reflected a firmer tendency on this showing.

Lead

The conspicuous features in lead recently were sales activity and price stability. These two factors have gone hand in hand during

the past month. Transactions for prompt and forward positions were in large volume at the New York basis of 6.65c and at 6.50c East St. Louis. A limited tonnage of nearby lead was reported at a slight concession from regular quotation in the mid-west territory, but this did not influence producers generally to modify their price. Buying has been too aggressive lately to suggest other than stronger market conditions. The current year has begun with a high rate of consumption, and no retreat from this situation is expected in the immediate future. World output of lead by reporting countries in 1928 was placed at 1,648,036 tons, as compared with 1,647,591 tons in 1927. Conditions reflect the strength of the statistical position. A broader buying interest is likely to develop, and the market may soon record an advance.

Aluminum

The general situation in aluminum is strong, and there are many indications of heavy consumption. Shipments to the automotive industry and other manufacturers are maintained at a heavy rate, and some industries show an expansion of demand. Producing concerns are finding a free outlet for the bulk of capacity, and recent developments point to increased facilities of output. Domestic producers will be in excellent position to handle the diversified demand for plates, sheets, ingots and the various alloys. Production and consumption are both expected to grow in importance during 1929. Prices have been uniformly firm for many months at 24.30c for Alcoa mill 99% plus. Imports of primary aluminum pig metal into the United States in 1928 were reported at about 38,000,000 pounds, as compared with 68,389,641 pounds in 1927. Stocks in bond at the end of October 1928 (latest available returns) were 13,800,348 pounds, against 8,817,699 pounds at the close of September and 3,679,064 pounds on August 31, 1928.

Antimony

A moderate volume of sales were reported in January, but there were many pauses in market activity due to lack of any special tendencies to create interest among large buyers. Prices of Chinese regulus last month fluctuated between 9.40c and 9.62½ duty paid. Recent offers from China of February-March shipment were made at 7.62½c c.i.f. New York. Consumers and traders do not appear particularly bullish at present. Stocks of antimony in bonded warehouses at end of December were reported at 3,320,667 pounds, compared with 2,025,785 pounds at the end of November. Arrivals here were fairly large last month and additional shipments are due.

Quicksilver

The quicksilver market has eased off lately, with present quotations at $120 per flask. The high price in January was $123.50. Bonded stocks at end of November 1928 were 362,982 pounds.

Platinum

A downward tendency in offerings was recorded last month. Demand was not urgent enough to maintain the price at the opening level of $69 per ounce. Present quotations for refined platinum is $66, and compares with a recent low of $65 per ounce.

Silver

There were no exceptionally interesting developments in the silver situation lately. Prices have moved within a narrow range for several weeks, and although present prices are considered low there are not many signs of pronounced improvement. Quotations reached 57½c last month and subsequently declined to 56⅜c. The current quotation on February 1 was 56¾c. China was a frequent buyer in the first half of January, but demand from that quarter fell off perceptibly. India has been a rather indifferent factor for some time. More urgent buying by the Far East is needed to impart enthusiasm and tone to the market. United States production of silver in 1928 was 56,314,000 ounces against 59,412,000 ounces in 1927 and 60,918,000 ounces in 1926 according to American Bureau of Metal Statistics. Stocks of silver in producers' hands in the United States on January 1, 1929, were 1,011,000 fine ounces compared with 905,000 ounces on December 1, 1928.

Old Metals

Following the upward trend in the market for new copper, the demand for scrap copper and brass grades has been fairly active at higher prices. Light copper and composition metal have shared in the recent activity. Consumers have been ready to meet the higher quotations, and shipments have found a good outlet for domestic consumption. There is some export inquiry, but European interest appeared to be a rather minor factor. The local demand has provided the largest measure of activity. Dealers buying prices, New York basis, are quoted at 14½c to 14¾c for strictly selected crucible copper, 12c to 12¼c for light copper, 8¾c to 8½c for heavy brass, 11c to 11¼c for new brass clippings, 5c to 5¼c for heavy lead, 3¼ to 3½c for old zinc, and 16¾c to 17c for aluminum clippings.

Daily Metal Prices for the Month of January, 1929

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1*	2	3	4	7	8	9	10	11	14	15	16	17
Copper c/lb. Duty Free													
Lake (Delivered)	....	16.875	16.875	16.875	16.875	16.875	16.875	16.875	16.875	16.875	16.875	16.875	16.875
Electrolytic (f. a. s. N. Y.)	....	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75
Casting (f. o. b. N. Y.)	....	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50	16.50
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	....	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35
Brass Special	....	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	....	49.875	49.375	49.25	49.75	49.875	49.75	49.25	49.375	49.00	49.10	49.00	49.375
Pig 99%	....	49.25	48.75	48.375	49.125	49.125	49.00	48.375	48.50	48.25	48.25	48.125	48.625
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	....	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Aluminum c/lb. Duty 5c/lb.	....	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	....	35	35	35	35	35	35	35	35	35	35	35	35
Shot	....	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	....	37	37	37	37	37	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	....	9.625	9.625	9.625	9.625	9.625	9.625	9.625	9.625	9.50	9.50	9.50	9.50
Silver c/oz. Troy Duty Free	....	57.125	57.125	57.25	57.25	57.25	57.375	57.50	57.25	57.50	57.25	57.125	56.75
Platinum $/oz. Troy Duty Free	....	69.00	69.00	69.00	69.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00

	18	21	22	23	24	25	28	29	30	31	High	Low	Aver.
Copper c/lb. Duty Free													
Lake (Delivered)	16.875	16.875	17.125	17.125	17.125	17.125	17.125	17.125	17.125	17.125	17.125	16.875	16.966
Electrolytic (f. a. s. N. Y.)	16.75	16.75	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	16.75	16.841
Casting (f. o. b. N. Y.)	16.50	16.50	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.75	16.50	16.591
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb													
Prime Western	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35	6.35
Brass Special	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45	6.45
Tin (f. o. b. N. Y.) c/lb. Duty Free													
Straits	49.20	48.875	49.00	48.875	49.125	48.875	48.75	48.625	48.50	48.70	49.875	48.50	49.159
Pig 99%	48.25	48.125	48.125	48.00	48.25	48.00	47.875	47.75	47.625	47.75	49.25	47.625	48.341
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.50	9.50	9.40	9.40	9.50	9.50	9.625	9.625	9.625	9.625	9.625	9.40	9.559
Silver c/oz. Troy Duty Free	56.75	56.875	56.375	56.625	56.50	56.75	56.75	56.875	56.875	56.75	57.50	56.375	56.994
Platinum $/oz. Troy Duty Free	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	66.00	69.00	66.00	66.545

*Holiday.

Metal Prices, February 11, 1929

NEW METALS

Copper: Lake, 18.125. Electrolytic, 18.00. Casting, 17.75.
Zinc: Prime Western, 6.35. Brass Special, 6.45.
Tin: Straits, 49.625. Pig, 99%, 48.50.
Lead: 6.75. **Aluminum,** 24.30. **Antimony,** 9.60.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $120. **Bismuth,** $1.70.
Cadmium, 95. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 56.125.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $66.50.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	12¾to13½
Brass Ingots, Red	15¾to16¼
Bronze Ingots	17 to20
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	24 to40
Manganese Bronze Ingots	14 to18
Manganese Bronze Forging	32 to42
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	16½to18½
Phospo Copper, guaranteed 15%	18½to22½
Phospo Copper, guaranteed 10%	18½to21½
Phosphor Tin, no guarantee	60 to70
Silicon Copper, 10%, according to quantity	28 to32

OLD METALS

Buying Prices		Selling Prices
15½to16	Heavy Cut Copper	16½to17
15 to15¼	Copper Wire, mixed	16 to16¼
12¾to13	Light Copper	13¾to14
10¾to12	Heavy Machine Composition	11¾to13
8¾to 9	Heavy Brass	9¾to10
7¼to 7½	Light Brass	8¼ to8½
10¼to10½	No. 1 Yellow Brass Turnings	11¼to11½
10¾to11	No. 1 Composition Turnings	11¾to12
5½to 5¾	Heavy Lead	6¾to 7
3½to 3¾	Zinc Scrap	4¾to 5¼
8 to10	Scrap Aluminum Turnings	12½to14¼
13 to13½	Scrap Aluminum, cast alloyed	17½to18½
19 to20	Scrap Aluminum sheet (new)	22 to22½
30½to32	No. 1 Pewter	35 to38
20 to21	Old Nickel Anodes	22 to23
20 to23	Old Nickel	22 to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled) .....27⅜c. to 28⅜c. net base
From Stock .....28⅜c. to 29⅜c. net base

BARE COPPER WIRE

19¾c. to 19½c. net base, in carload lots.

COPPER SEAMLESS TUBING

27¾c. to 28¾c. net base.

SOLDERING COPPERS

300 lbs. and over in one order .....25⅞c. net base
100 lbs. to 200 lbs. in one order .....26⅜c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	9.75 net base
Casks, jobbers' price	10.25 net base
Open casks, jobbers' price	10.75 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 57¾c. to 59¾c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect Feb. 8, 1929
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass	Low Brass	Bronze
Sheet	$0.22½	$0.24	$0.26
Wire	.22¼	.24½	.26½
Rod	.20¼	.24¾	.26¾
Brazed tubing	.30½	....	.35¾
Open seam tubing	.30½	....	.33¾
Angles and channels	.30½	....	.33¾

BRASS SEAMLESS TUBING

27⅜c. to 28⅜c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	24½c. net base
Muntz or Yellow Metal Sheathing (14"x48")	23½c. net base
Muntz or Yellow Rectangular sheet, other Sheathing	24½c. net base
Muntz or Yellow Metal Rod	20½c. net base

Above are for 100 lbs. or more in one order

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	30¼c.	10% Quality	33¼c.
15% Quality	31¾c.	15% Quality	37c.
18% Quality	33c.	18% Quality	40¼c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, February 11, 1929

ANODES

Copper:	Cast	26¼c.	per lb.
	Rolled, oval	25c.	per lb.
	Rolled, sheets, trimmed	25½c.	per lb.
Brass:	Cast	25¾c.	per lb.
Zinc:	Cast	12¼c.	per lb.

Nickel:	90-92%	45c. per lb.
	95-97%	47c. per lb.
	99%	49c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 59¾c. to 61¾c., Troy ounce, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$29.65
14" 20 ply 64/68 Unbleached	38.20
12" 20 ply 80/92 Unbleached	32.45
14" 20 ply 80/92 Unbleached	44.00
12" 20 ply 84/92 Unbleached	42.50
14" 20 ply 84/92 Unbleached	57.60
12" 20 ply 80/84 Unbleached	38.35
14" 20 ply 80/84 Unbleached	52.00

Sewed Pieced Buffs, per lb., bleached ..... 45-65c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.14-.19
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 and 125 lb. drums	lb.	.20½-.21
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.17¼-21¾
Denatured, drums	gal.	.48-.56
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.039
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride, solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls.	lb.	3.3
Sulhpocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16½-.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.0635
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry, bbls.	lb.	.34
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.13
Salts, double, 425 lb. bbls.	lb.	.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.46½
Cyanide (fluctuating)	oz.	.57-.60
Nitrate, 100 ounce lots	oz.	.40
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.18
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.38
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¾